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EDITORIAL NOTES—GAS, &c.

Current Experiences and Methods of Procedure.

DURING the past week, three of the important Gas Companies operating in extra-Metropolitan areas held their meetings; and at each the proprietors manifested quite a stoical demeanour towards the heavy cloud of advanced cost for raw material that hangs over the gas industry, in common with others. We do not desire in any way to make light of the position; for it must be fully realized that, unlike most other industries, coal is at the root of the entire gas business. It is, where water gas is not employed, the sole raw material required in manufacture. But while this is so, and the industry is hardly hit, proprietors and consumers are not loud in complaint. It cannot, however, escape notice that the reports of the meetings of other industrial enterprises, the great activity in trade notwithstanding, are filled with lamentations regarding declining profits in proportion to the business done—that is to say, that, per unit of business, the profits realized are now lower than formerly. Severe competition on the one hand, and the higher values of raw materials on the other, are doing their work; and in those industries the advantages of competition—the primary regulator of prices—are for the present being reaped entirely by the consumers, without the activity in trade producing additional benefit for those engaged in it. There is but one end to this kind of thing, and that is combination, under the cast-iron laws of which the consumers, as a rule, suffer, if there is not statutory regulation. Most of the industries referred to are what may be termed one-product industries; and over them the gas industry has, as Mr. Corbet Woodall reminds in a few remarks at the meeting of the Croydon Gas Company, the benefit of a great number and variation of products and divers uses for the staple product. The result, so common experience tells us, is that when one product is depressed others render better aid. Indeed, the industry during the past quarter of a century has been marked by marvellous vitality and procreant power; and never more so than at the present time. And yet its position has only been maintained by renouncing high profits, and resting content with, for an industrial enterprise, a modest return on the capital invested. All that the industry has done for capital through its expansion has been to give greater scope for safe investment—nothing more. But in safety there is an infinity of value; and the lesson to be derived from contrasting our industry with others is that a broad base is the safest of all foundations. Therefore, the greater the number of outlets for products, the greater the number of applications, the stronger the industry. We have not yet exhausted the possibilities before the industry; but they will not unaided develop themselves.

The coal question naturally outweighed all others at the meetings of the South Suburban, the Croydon, and the Tottenham Companies. The excellent state of the accounts of these Companies for the past six months must not be taken as a fair gauge of what the financial position in the next twelve months will be under the burden, in each case, of the several thousand pounds excess in the cost of coal. Those who so take them may find, before many months have lapsed, that they have accepted untrustworthy guides. Throughout the past six months, coke has followed coal in the upward direction; but coincidently the Companies have been working out their contracts for coal at lower prices than those now obtaining. From coke they have realized something in the region of 1s. extra per ton of coal carbonized, to set against the cost of coal at for most part the lower prices of last year, and in small part at the higher prices now ruling. This happy condition of things ceases altogether now; and, as Sir George Livesey at the South Suburban meeting, Mr. Charles Hussey at the Croydon meeting, and Mr. Corbet Woodall at the Tottenham meeting, warned the proprietors, in order that they should not pitch their expectations too high, the heavy prices for coal will rule throughout the coming year, so that the same proportion of advantage from coke cannot be anticipated. Coke will no doubt continue to command its present prices; but whether it will further improve in value will depend largely on the tendency of the coal market. There are, however, no indications at present of the course of the latter being diverted. On the contrary, since the South Suburban contracts were made three months since, there has been a further rise from the prices paid of 2s. per ton f.o.b. at the pit.

Circumstances alter cases. Whether or not the managements of gas undertakings will raise their charges for gas under the influence of higher coal prices should depend entirely upon their individual circumstances, without reference to what others are doing. We have no sympathy with those who play the game of follow-my-leader in such a matter as this, nor with those who say that, if they do not advance the charge for gas when paying higher prices for coal, the consumers will cry out against normal charges for gas when the price of coal is low. There is pusillanimity and covertness about such an administrative policy that does anything but court admiration. When market conditions are easy, and gas companies are able to supplement reserves and accumulate good undivided balances, the consumers are entitled to consideration when temporary tension is produced by an upward change in market prices. When treated with frankness, consumers are not the unconscionable beings that some people imagine. To this Sir George Livesey bore witness at the South Suburban meeting. In their case, circumstances compel an advance in the price of gas by 2d. A circular was issued to 36,000 consumers of the Company stating the reasons necessitating the rise; and there has not been a single complaint. The Company's former price was 2s. 5d. The Croydon Company are not contemplating an immediate (if any) increase of their price of 2s. 8d.; nor are the Tottenham Company of their price of 2s. 6d. Here are instances of how circumstances alter cases. The price of gas of the South Suburban Company has been lower than that of the other two Companies, their carry-forward is smaller, and their present percentage increase in consumption is not on the same high scale as in the other two Companies, through dissimilar local conditions. The South Suburban Company's carry-forward of undivided profits amounted to about £2000, Croydon to £7487, and Tottenham to nearly £20,000; while the percentage increase in business of the South Suburban Company nowhere approached the 8·27 of Croydon and the 9·93 of Tottenham. We mention these matters solely for illustrative purposes, to show how circumstances alter cases, and that the question of increasing price must, and should be, determined by individual condition, and not by any haphazard method, imitation, or suspicion that a rise is imperative to avert some dark view on the part of the consumer. That is not administration. It is something that deserves a name of a different complexion.

As already remarked, there are no present indications of a turn for the better (from the consumers' standpoint) in the coal market; and no one can possibly tell what the future has in store in this matter. Sir George Livesey views with some apprehension the effect on the price of coal of proceedings in Parliament, from which, by the way, there is to be a respite until next session. The Miners' Eight Hours Bill he regards as a disguised offspring of Socialism, for which the present Government has committed itself to stand as sponsor; and he believes that it is simply and solely intended to advance the doctrines of Socialism. However this may be, that there is no necessity for the measure has been proved beyond all manner of doubt, both by statistical facts and the evidence of disinterested people. The plea for this crusade, that a shortened working day will absorb the unemployed, has been shorn of its plausibility, and its absurdity stands in a state of nudity. To fit the case of numbers of the unemployed, Parliament would have to supplement this measure by one for a no-hour working day and good pay for those who proved themselves adept as time-

wasters. Those who want to improve their positions should try the less circuitous route discovered and successfully tried by the South Metropolitan and South Suburban Gas Companies, and partially by two or three other undertakings. The difference between the scheme as applied by the two Companies named and the Commercial Company is in the Workman-Director; and Sir George is confident, from his experience for the best part of a decade, that the Workman-Director is an essential part of the scheme. It is the one thing necessary to give the men responsibility in management, to maintain close contact with them, and to keep suspicion outside the gates of the works. The fear of Workmen-Directors using their position for the promotion only of class interests has been found to be groundless. They look at the administrative work from all points of view; and not only so, but they bring their experience of the practical operation of the concern to bear upon the administrative work. This is more than all Directors can do. United to this point is the testimony that Mr. A. E. Broadberry gave at the meeting of the Tottenham Company as to his experience of the value of technical gas men on the Board of Directors. It will be found worth reading.

Commercial Gas Affairs.

Good fortune has attended the Commercial Gas Company in the past half year. They have come out of their trading with the increased expenditure nearly balanced by the increased income from gas, rentals, and residuals; and therefore the proprietors will meet the Directors next Thursday with every satisfaction. The expenditure for the six months increased, in comparison with the first six months of last year, by some £14,089; but coal and oil alone stood the Company in for an additional outlay of £14,857. There were various other increases in disbursement, but economies in certain other items wiped them out and nearly £800 of the extra expenditure on raw materials. If the additional income had been larger by £505, a clean balance would have been struck between the revenue account of the past six months and that of the first half of last year—the amount carried to the net revenue account on this occasion being £61,806, while twelve months ago it was £62,311. The consumption of gas, it is remarked, increased by some 48,078,000 cubic feet; and the receipts for gas were £5553 better—the charge being the same. Also, in contrast with the figures of a year ago, the numbers of stoves fixed have put on a further 6000, and prepayment meters 8000. The result is that rentals produced upwards of £2000 more. Residuals yielded £5874 more; coke being the best contributor, with £5046. Breeze brought in £1324 more. Tar produced about the same; but there was a fall of a few hundreds in the receipts for ammoniacal liquor and sulphate of ammonia. The income of £263,182 was £13,584 more than a year ago, which comes very close to the £14,089 increase in the total expenditure. The figures show good administrative dealings and technical working.

Unsolved Problems of the Large Gas-Engine.

There have been those who have lamented that this country has not been in the van with continental countries in the building of gas-engines of the larger powers. That we have not been, is not really a matter for any great regret; for the experience with which these other countries have furnished the gas-engine world has brought into relief the fact that the beautiful and highly finished work that these engines present to the eye does not envelop the final solution of the great fundamental problems which must be solved before the ultimate economic stage can be reached. So far as the engines have shown inherent defect, they have—at a cost—served a useful purpose in progress, apart from their ordinary service. The jump, however, from comparatively low-power engines to these tremendously high-power ones has been too rapid—the leaps have been too great, the pace in taking them too fast. Quite different sets of conditions open out in engine building with expansion in size and power; and these have to be ascertained and conquered before, in the matters of cost of structure and resulting efficiency in action, these large engines can bear any direct ratio to the engines of smaller magnitude. The progress that has been made in solving the problems clustering about these mammoth engines, has been slow; and the difficulties are such that to-day authorities like Mr. Dugald Clerk speak with sensible caution as to the probable perfection of success. Do not hurry, but work doggedly, and with a belief that the obstinate problems confronting can be worn down by perseverance, is, in effect, the tenor of a paper he read before the Engineering Section at the British Association meeting at Leicester; and the fact that Mr. Clerk himself is continuing his researches in order to master the later problematical disclosures of experience, is a hopeful sign—however prudent he may be in expression—as to his anticipation of ultimate success.

The trend of view of engine-makers, in connection with these extraordinary structures, is that it is desirable to keep down cylinder dimensions as much as possible; and this is due, as Mr. Clerk points out, to the recognition of two facts: Practical difficulties with large diameter cylinders due to unequal expansions resulting in cracking; and a better appreciation of the fact that increase in cylinder and other dimensions requires extra expenditure in metal and workmanship in greater proportion than the augmentation in the power realized. The two main problems are to build engines of large power which will continue to run effectively and economically for long periods without breaking down, and to build such engines at costs sufficiently moderate to enable the engine to compete effectively with the large steam-engine in the matter of first cost. The first part, Mr. Clerk tells us, has been solved; but it has involved weights of material and costs of construction which are almost prohibitive, considering the moderate powers obtained. Upon which comment may be passed that the "solution" does not appear to be a very satisfactory one; and, with him, it must be agreed that sound commercial success will not be achieved with these larger type gas-engines until some better solution be found than their present construction. There must be a reduction of weight as well as of cost, and increased power from the unit. Mr. Clerk does not attempt to mask the direction of his own essay in effecting a solution of the problems besetting the gas-engine maker. His attempts are shaped towards reducing the maximum pressures, as well as temperature, without reducing the mean pressures, in order to diminish the weight of an engine for a given power, and to secure moderate thickness of cylinders and combustion chamber castings. There are several ways of doing this; but greater knowledge is required of the properties of the working fluid. The direction in which Mr. Clerk is working is in compounding—a line which others have fruitlessly pursued in the past. The problem Mr. Clerk believes is more one of working fluid than pure mechanism; and, following up this belief as he is doing, he incites the hope that he has alighted on the right track, and that he will succeed where others have failed. He has our best wishes for the maintenance of a confident spirit, and for the ultimate success to which he aspires.

The conservative attitude in the matter of these large gas-engines of British makers has been fully justified, though we cannot reject the fact that the boldness of Continental makers has opened to plainer view defects, the things to be avoided, the requirements, and new roads for investigation. Meantime it is pleasing to have Mr. Clerk's authority for again saying that commercially in the lower power machines the British gas-engine industry continues to move forward in a most satisfactory manner.

The Gifts of Science.

Possibly there are but few among our readers who noticed in the "Journal" for July 16 that two matters superficially without connection, really had a singular relationship. In that issue, there appeared the programme emanating from the Leeds University relating to the new department within which those who are intending to devote themselves to the professional work—and what a breadth that work has now attained!—of the gas industry may obtain that special drilling in fundamental scientific principles that will throw light upon, increase comprehension of, and broaden sympathy with, practical work, to the end that the man will be more valuable, his work more far-reaching. In the same issue, the new branch of work of the Leeds University received, as it deserved, editorial approbation. In the same issue, too, we recorded the death of Sir William Perkin, the greatest achievement in whose career, and the sequel to that achievement, trumpet forth the need of a greater direct application of science to the practical work of the gas industry.

Pause and consider. Men of science outside the industry have given us life and development from all points. The regenerative system of heating—producing fuel economy and heightening the yield of carbonization—came to us

from without. The bunsen burner, making possible the incandescent gas-light, and the cooking and heating stove, came from without. The very mantle, denied which competition with electric lighting would have been futile, came from without. The principles and whole development of the gas-engine—whence came they? From without. And Perkin, unidentified with the gas industry, removed the veil from the wealth of that complex substance which the gas industry so freely produces under the name of coal tar; but the gas industry and the country lacked, fifty years ago, the acumen, ability, and scientific knowledge to turn Perkin's discovery to their own enrichment. Was it therefore science, practice, or rule-of-thumb that gave us every radical part of the extensive system of production and utilization covered by the title of the gas industry? There is only one answer. We have to thank Science—Science brought to bear from beyond the confines, wide as they are, of the industry, and not from within. We do not say that, under other circumstances, the work that has been done for the industry from outside its pale could have been done better from within. But we do say that without the aid of Science the gas industry could not have survived the pressure that has been brought to bear upon it; and without Science there could not have been the development over which we are in a position to rejoice to-day. Acquiescing in this, does it not follow that, if we can bring into the industry—by combining scientific with practical knowledge—more of that to which we are so much indebted, the industry will be the better and the stronger for it. We believe there are many laurels yet to be won in the gas industry; and the worker whose intellectual capacity and force are broadened and quickened by training such as that planned out at the Leeds University (preliminary to, but not to displace, the practical experience of the works) will stand a brighter chance of winning those laurels than the man whose ideas and knowledge have been stunted by an entire training in the largely rule-of-thumb atmosphere of the workshops. We have to submit to an acknowledgment of what Science has done for the industry, and then the easier is it to appreciate the part that Science must have in our work in the future.

Perkin's life-work has been one of illustration. Let us now suppose (without suggesting that, had circumstances been different, it would have been so) the honour of the greatest discovery of Perkin had been that of a scientifically and practically trained gas man of this country. How different things would then have been for the gas industry. We should not now be perennially bemoaning the low values of tar, and looking with jealously upon the great gains that Germany has derived from the discovery of Perkin, which gains represent our losses, and losses due to indifference. If we take Mr. Consul-General Oppenheimer's report for 1906, there is reading to be had which gives indication as to the substantial character of those gains to Germany, and of the losses to this country, though some members of the German chemical industry believe that high water-mark for them has now been reached. But what a high water-mark it has been! Consul Oppenheimer says the shares of the factories stand at a great premium; and no wonder, seeing that the dividends of the different chemical factories last year are represented by such figures as 10, 12, 20, 22½, 30, 36 per cent. We see, too, that the value of the excess export by the factories of artificial dye-stuffs rose in 1906, against 1905, by 27 million marks.

These are facts; and it is not pleasant to contemplate that here we have one of the results of the want of close fellowship, until quite recent years, between Science and Industry in this country. It was Science that was kept at arm's length by Industry. Exclusiveness, self-satisfaction, self-sufficiency, indifference reigned supreme. Only under pressure was the aid of Science readily received. Things have changed now, and are still changing. On all hands, it is admitted that the greatest industrial progress has been, and must be, along the highway provided by Science; and the gas industry is not excepted. If Perkin's grand discovery, and the missing by this country and the gas industry of the fruits of that discovery, are kept in mind, together with the indebtedness of the industry to Science for all that is fundamental in it, there will not be the least difficulty in extending the heartiest sympathy and support to the larger work that is now being entered upon by the Leeds University, under the direction of certain of its learned Professors.

This very subject of our indebtedness to Science for material progress stood in the fore part of the address delivered to the Engineering Section of the British Association at their meeting in Leicester, by Professor Silvanus Thompson. It was an address which all should read who have not sufficiently appraised the relations and the interaction between Science and its practical applications. Professor Thompson propounds the inquiry, What is it that has made for our great material progress? He finds but one answer—Science. Chemistry, physics, mechanics, mathematics; it is these that have given to man the possibility of organizing the tremendous development that has been effected. But all the good does not flow from Science to industrial application. There is a reflex influence; and Professor Thompson recognizes it fully, in the pregnant sentence: While pure science breeds useful inventions, it is none the less true that the industrial development of useful inventions fosters the progress of pure science. The interaction, the mutual help, is clearly traceable, and there is mental obtuseness on the part of the man who ventures a denial.

Some Remarkable Statistics.

At the meeting of the Tottenham and Edmonton Gas Company last Saturday, Mr. Corbet Woodall quoted some really remarkable figures, which show how progress of business, prudent management, wise expenditure of capital, and the development of efficiency in manufacturing processes, have combined to produce benefit for the consumers, the proprietors, and the undertaking itself. The figures have some bearing upon correspondence that has been proceeding in our columns as to the expenditure of capital per million cubic feet of gas sold. The amount of capital expenditure per million cubic feet of gas hangs very largely upon conditions uncontrollable by the management of a gas-works, whether it be company or municipal administration. If a gas company could work miracles, and produce of its own free will all those conditions that tend to the lowering of the capital per million cubic feet, there would be few, if any, that would not have taken the matter in hand long ago. A gas company cannot do much, other than by the best service it is possible to render under its peculiar circumstances, to stimulate the growth of a district. The district served by the Tottenham Company has been an exceptional one in the rate of its development in building and population. The result for the Company (who have made the best use of their opportunities) has been in the last four decades, increases in consumption of 142 per cent., 131 per cent., 70·3 per cent., and 214 per cent. Since 1866, the capital has been reduced from £1377 per million cubic feet to £461; the price of gas from 5s. to 2s. 6d.; and the requirements of dividend and interest have fallen from 2s. 0·44d. to 6·39d.

London Progressives and Gas and Electricity Supply.

The Liberal Members of Parliament representing London constituencies are also representative of Progressive aspirations. These gentlemen are concerned over the supposed neglect of Parliament in legislating for the Metropolis, although the Metropolis is happier now than when the Progressives ruled in the local government. These well-meaning—if over-ambitious—gentlemen waited the other day upon Sir Henry Campbell-Bannerman and Mr. John Burns, and submitted to them some old Progressive notions in new dress, on which it is suggested there is "urgent need" for legislation, and asking that the Prime Minister should allow of the preparation of a Government measure for the session of 1908, dealing with as many of these subjects as he thinks feasible. Among the objects the Progressives have in view are: The institution of one uniform rate to provide for all expenditure on local government in the Metropolitan area, accompanied by such financial control in the hands of the central representative body as would "effectually secure" economy in administration; the establishment of the Central Council as the assessment authority for London (we know well the views of the Progressives as to higher assessments); and some arrangement whereby the water, gas, and electric undertakings of London shall fall ultimately into the possession of the Central Council. The Metropolitan Gas Companies are so used to this proposal, that in Horseferry Road, Old Kent Road, and Stepney the objects of the visit of the deputation to Sir Henry were, we venture to assert, read without the slightest flutter of excitement. The upshot of the visit was that Sir Henry put off the aspiring Progressives as kindly as he could. There were no promises of

legislation for next session; but there was the vague one that the Prime Minister would see to it that these and the other "important" questions brought before him should be dealt with ere the Government were laid to rest. Mr. Burns also feelingly promised legislation "at the earliest convenient opportunity" upon those matters on which unanimity prevailed——among whom, the Progressives or the people of London? With professions of the greatest sympathy ringing in their ears, the deputation left the presence of the Premier and the President of the Local Government Board. Incidentally, it is noted that Progessivism and Communism are one and the same thing, and also that the Progressives, though anxious to be some day the sole purveyors of electricity in London, are satisfied that the gas industry is not doomed, but is worth having in their possession.

A Joint Advertising Scheme for Gas.

Until last week, nothing further has been heard of the proposal, launched by Mr. F. W. Goodenough at the meeting of the Institution of Gas Engineers, for a fund subscribed by gas undertakings for advertising in publications that have universal circulation. But a few days ago, a copy of the "Advertising World" came to hand; and there we find, in an article on the suggestion, that it secures the complete approval of the editor. Our contemporary remarks:

> As Mr. Goodenough said in his paper, there is an important field for advertising in periodicals which cover a vastly wider field than the area of supply of any one company; and it is not to be expected that a single company should bear all the expense of gaining a publicity which must benefit the industry as a whole. It will be interesting to note whether a suggestion so obviously sound meets with the support it merits. If it is allowed to fall to the ground with no result, the gas manufacturers of this country will be convicted of a deplorable lack of enterprise. But better things may be hoped for—the leaven of a new spirit of what would once have been considered a dangerous experiment, has slowly permeated the whole lump of even our conservative commercial world, and even the most cataleptic of concerns are evincing a tendency to wake up. Mr. Goodenough's proposal won such warm commendation from subsequent speakers, that it is almost certain more will be heard of it.

We are afraid there will not be, unless some one in the gas industry sets to and makes a move in the matter. We have our own views as to what provincial gas undertakings will think of the scheme; howbeit, we should like to see the idea tried, believing in the largest possible range of attractive but not vulgar advertising. The cost per undertaking would be very trifling. Who will give the matter a push forward?

An American View of Municipal Ownership.

Some of our readers are doubtless aware that an important investigation into the subject of municipal trading has been carried out by the Americal National Civic Federation. It may be remembered that some time ago a representative Committee came to this country for the purpose of inquiring into British local government and the trading concerns associated with it. The Federation have lately issued several reports, which contain a great variety of opinions. In their final report, however, nineteen out of the twenty members of the Commission affix their signatures to what practically amounts to a condemnation of municipal ownership as practised in the United States. In their opinion, such ownership should be limited to matters affecting the public health, public safety, and transportation; and they consider it should "not be undertaken solely for profit." Their investigations teach them that no municipal operation is likely to be highly successful that does not provide for an executive manager with full responsibility, holding his position during good behaviour; for the exclusion of political influence and personal favouritism from the management of the concern; for the separation of the finances of the undertaking from those of the rest of the city's business; and for exemption from the debt-limit of the necessary bond issues for revenue-producing utilities which shall be a first charge upon the property and revenues of such undertaking. They suggest that no stocks or bonds for public utilities should be issued without the approval of some competent authority; and they recommend the consideration of a sliding-scale, which they say has "proved successful in some cases in England with reference to gas, and has been adopted by Boston." The effect of its adoption was shown in our columns last week.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 469.)

It has been said that we live in a record-breaking age. Originally applied to sports and pastimes, it seems now to be specially applicable in grim earnest to serious business. Lately from week to week we have had to note fall upon fall of the choicest of our investments; and now we have to note a further fall still. What may yet be attained would puzzle even a Chancellor of the Exchequer (who a month ago told us that 84¼ was Consols' bottom price) to say. We never prophesy unless we know. It is not easy to put one's finger on the plague-spot that caused all this decay. Probably there were many, some acting and reacting on each other. The condition of things in Wall Street and the tightening of money were two of them; while a general uneasiness prevailed as to "what was going to happen next." When matters are like this, even a small selling order will sometimes knock prices down—arousing an uneasy suspicion that the seller has got some first-hand information. When the Exchange re-opened on Tuesday, there was some show of cheerfulness, founded upon a little buying; but it did not last. Wednesday was very quiet, and prices shrank for lack of support; Consols dropping ¼. Thursday was worse, with a very flat tone; Consols marking 81¾. Friday opened with deceptive promises followed by renewed weakness; everything except Americans and South Africans being bad, and Consols touching 81 7/16. Saturday was not so bad all round; but Consols actually marked 81 1/16. In the Money Market, the rates for short loans were somewhat variable; but discount showed a hardening tendency all through. Business in the Gas Market began to shrink to its normal proportions in August; and, as might be expected, prices were at least to a slight extent influenced by the generally dull tendency. In Gaslight and Coke issues, the ordinary was moderately dealt in at pretty close figures, which ranged only from 94½ to 95½. Not much was done in the secured issues; the maximum marking from 88½ to 89½, and the preference from 105 to 107. South Metropolitan was very quiet at 122. In Commercials there was only one bargain in the 4 per cent., at 104; but the buying prices of the two issues were lowered. In the Suburban and Provincial group, Brighton original was done at 222½. The Continental Gas Companies were very inactive; Imperial changing hands at from 173½ to 174¾ (a fall of ½), Union preference at 140, and European fully paid at 22½ (a fall of ½). Malta was done at 4½. Among the undertakings of the remoter world, Bombay new realized 5⅛, and Oriental 142½; Primitiva was done at 6 1/16 and 6¾, ditto preference at 5⅛ and 5 1/32, River Plate at from 13 to 13⅛, and ditto debenture at 94 and 94¼.

ELECTRIC LIGHTING MEMORANDA.

"Meteor" on Gas and Electricity Meters—A Travesty of Facts—The Exactitude Obtained in Gas-Meter Manufacture—Changing Suppliers and Prices without Warning—How to Prove that Gas is Dearer than Electricity—London Electric Supply Bill withdrawn.

Anger, pure and alloyed, has moved "Meteor" of the "Electrical Times" to write about electricity and gas meters. The cause of irritation is a pamphlet circulated by the Reading Gas Company, in which electricity meters are not praised up as instruments of reliance and virtuous behaviour. The stinging words in the pamphlet are these: "The electricity consumer has no protection. He is committed to the readings of an instrument whose good faith has no guarantee, and whose abiding honesty even electricians will not vouch for." The "Journal" was originally responsible for these words. "Meteor" says "the policy that makes this half-truth the basis of such foolish misstatements cannot enjoy a very long and prosperous career." The hostile "Meteor" affects to show that the electricity consumer has protection; but it is a poverty stricken sort of protection, as compared with that given the gas consumer. He says that "the conditions under which the consumer *may call* upon the undertaker"—yes, the undertaker—"to supply a certified meter are duly laid down by Act of Parliament." There is the trouble. Householders do not as a rule purchase Acts of Parliament and pore over their contents before they become consumers of electricity. Where, then, is the protection? The sound protection that electricity consumers should have is that given by the Sales of Gas Act to gas consumers, among whom there is not a single meter placed that has not been tested and stamped at some official testing-place. It is not a question of "may call" with the gas consumers; it is a question of "must have." That is real protection. Then there are the conditions, "Meteor" says, under which the electricity consumer may have his meter re-tested ("*re*" if it has already been tested) if it be suspected of registering incorrectly. How many consumers know of these things?

"Meteor," with his fine ability at catching at straws to help his argument, says he "believes it was during the first week in June that the Chairman of the Manchester Gas-Meter Testing Committee announced that gas-meters known to be reading incorrectly to the extent of 40 to 50 per cent. were sent to various official testing-stations for report. These were returned to Manchester in

nearly every case marked as correct." How this loose statement helps "Meteor," it is difficult to see. The fact of the matter is he is off his own ground here, and does not appear quite certain of what he is writing about. In Manchester last year, the official report states, there were 43,868 gas-meters tested under statutory conditions; and only 1·31 per cent. were rejected. But in Manchester they have a supplementary test known as the "index test;" and the total number of cases of defect found under this test—remember there were 43,868 meters tested—was only 96! It was these meters that had been found correct under the registration test; but the supplementary test had revealed defects not discoverable under the ordinary test, and it was then possible to make the necessary adjustment to produce perfection before stamping the meters as fit and responsible instruments for use. What "Meteor" looks upon as a point helping his case really shows the great care taken to ensure positive accuracy in gas-meters before stamping them as correct under the Sales of Gas Act—an Act the like of which, compulsory and stringent, the electricity industry has not so far had applied to it. The London County Council and others should move in this matter of getting a similar Act applied to the electricity industry. We recommend "Meteor," if he has not already done so, to get a copy of the Act, and fortify his knowledge as to gas-meter testing and stamping, and then place it alongside the milk-and-water provisions referring to meters in the Electric Lighting Clauses Act of 1899. Now what does "Meteor" mean by talking about half-truths after the version he gives of the Manchester statement?

Let us see what other official reports say. In one of their reports on a twelvemonth's testing, the officers of the London County Council state that 2396 new electricity meters were tested by them, of which only 1226 (or 51 per cent.) could be passed as accurate at the first testing; 410 (or 17 per cent.) were passed as accurate after adjustment and further testing; and 760 (or 32 per cent.) were rejected as inaccurate. How many meters were fixed during that year in the Administrative County of London that were not tested by the County Council? It would be very interesting to know. In one of his reports, the Lighting Inspector of Liverpool stated that in the course of the year 4654 gas-meters were tested for the Gas Company, of which only 105 were rejected as inaccurate (2·2 per cent.); 2981 electricity meters were tested, and no fewer than 1089 were rejected as inaccurate (or 36½ per cent.). In the year ending March 31 last, 71,358 new gas-meters were tested by the Middlesex County Council; and out of this large number, only 2640 were rejected. The Inspector to the Corporation of Reading had 1050 meters submitted to him last year; and only 21 were rejected. The figures from these various reports speak well for the exactitude obtained in the manufacture of gas-meters. More need not be quoted. But we should like to know whether "Meteor" is of opinion that the electricians who took part in the "Electrical Review" correspondence on meters in the summer of last year were simply frothing; and whether he thinks that Mr. A. C. Hanson who was writing in the same paper a short time since did not know what he was talking about, when he said: "Even with careful supervision, it is impossible to ensure that a large proportion of meters will even start on a 220-volt 8-candle power lamp." Meters that fail in being a positive arbiter of consumption on one side may be depended upon for not being very particular on the other side. Of course, "Meteor" may know more about these things than practical electricians.

In most businesses where custom is regular and not casual, it is deemed but a common act of courtesy to inform the customer of any change of ownership of the business, and certainly of any variation in price of the commodity supplied. The Marylebone Borough Council have recently had certain portions of Hampstead incorporated in their administrative bounds, and by agreement, under the London Electric Lighting Areas Act of 1904, the same portions were transferred to Marylebone for electric lighting purposes. Of this transfer, the consumers (according to one electrical paper) do not appear to have had any notice or warning; and for them up went the cost of electricity without their knowledge. The Hampstead rate was 4d. a unit, but the Marylebone rate was 8d. per unit up to 200 hours' use a quarter, after which it came down to 1d. Certain of the consumers, on finding that their electricity bills had doubled, declined to pay any more than the Hampstead rate; and for standing out against what they considered to be a great injustice and, we may suppose, impertinence, they were hauled up at the Marylebone County Court, where His Honour Sir William Selfe sympathized with them, but told them they must submit. Whether this is good law or not has to be determined; but when an agreement is made to take a supply of gas or electricity, that agreement is based on the current or a contracted price. The contract price cannot be altered without ending the contract or by the concurrence of both parties; nor should the price upon which ordinary business relations are entered be altered without notification to consumers. In this Marylebone case, it appears that the price was altered; and we hope the defendants will appeal, and test whether a commodity at a higher price can be supplied to them without as much as "by your leave." The Act, it is stated, gave the Marylebone Council the same powers over the added portions of the borough as they had over their original part. This may be agreed; but it surely does not invest the Council with the right to secretly take a man over as their customer, on their own terms, without as much as allowing him the opportunity of saying whether he desires to continue his custom under the changed circumstances.

We have to thank Mr. Kenelm Edgcumbe, on behalf of the gas profession, for his good opinion. "So long," he says in a letter to the "Electrical Review," as it is simply a question of juggling with candle powers, the gas 'expert' [he quotes the word 'expert'] is *facile princeps*." Mr. Edgcumbe belongs to the school of finical electricians who wander among candle powers per hour or per annum, "mean candle-foot to 20 yards," and work out figures to the third place of decimals, to prove that electricity is cheaper for street lighting purposes than gas. They eschew altogether, as being beneath their notice, such gross figures as those shown in the annual accounts of public lighting authorities. To arrive at his costs per mean candle-foot per yard length of street, Mr. Kenelm Edgcumbe has been using a Trotter "Universal" photometer; and after an amazing "juggling" with figures—if it is not juggling, what is it?—he arrives at these among other results: Osram lamp, using 105 watts per hour, mean candle-foot to 20 yards, 0·098; while a low-pressure gas-burner, consuming 4·25 cubic feet, returns only 0·04! The relative cost of gas and current (at 2s. 2d. per 1000 cubic feet and 1½d. per unit), he gives as 1·2 and 2·1. How transparent and simple! We are not going to worry out what Mr. Kenelm Edgcumbe means; but we should advise him to make his illumination tests and comparative costs so that the people who have to pay for the lighting can understand them. He suggests that, if station engineers could be persuaded to make a few simple illumination tests in their own districts, they would have authentic figures to lay before their lighting authorities, instead of mere candle power. We should advise station engineers not to attempt to perplex their lighting authorities by following Mr. Edgcumbe's abstruse example, however great he may be as a man of light and leading, however big he may be as an "expert," and however "*facile princeps*" and saintly he may be when dealing with gas and electricity figures. Lighting authorities want something they can readily comprehend. We guarantee they would be staggered by Mr. Edgcumbe, but would much more readily appreciate certain passages in a report by Mr. H. Faraday Proctor, the Electrical Engineer of Bristol. Mr. Proctor tells his Committee that tests made at the Temple Back works with "Osram" lamps show that (taking the current prices for electricity in Bristol) an Osram lamp giving 32-candle power costs about 15 per cent. less per hour than an average 16-candle power carbon filament lamp, including lamp renewals in either case. There is something definite about this statement, which is much more satisfactory than those calculations that do not enlighten, but confuse the man in the street, and are subject to all sorts of local disturbing factors.

The Electric Lighting Companies of London have been driven into a corner with their joint scheme. Their Bill has been left derelict until last week, when it was withdrawn. There was, with the session so far spent, certainly no prospect of getting it considered this year; but perhaps the Companies were not particularly anxious for it to be considered after the rejection of the London County Council Bill, and danger had thus been removed. But there can be no doubt that the respite from trouble is only a very temporary one; for someone is sure to have an early shot to obtain authority for power and bulk supply, now that the County Council have shown that the will of the ratepayers is superior to their own in this matter. The suspense and uncertainty, however, must be intolerable for the existing undertakers; but it is a pity they do not try to make themselves secure by united action against these repeated attacks. Mr. Lloyd-George does not despair of something being done in a few months' time; but at present he cannot see how to bring the Municipalities, the Electricity Companies, and the London members to see things from one point of view. There must be, in his opinion, a common understanding on main principles before anything can be accomplished. There is a hint here for the existing undertakers. The question is whether there cannot be some "common understanding" which will prevent an outside concern coming in to depreciate the 20 millions of capital already involved in electricity supply in London.

Dr. Bueb and the German Continental Gas Company.—It is announced that Dr. Julius Bueb, well known as the designer of the Dessau vertical retort, and patentee of several processes in connection with gas manufacture, gave up on the 1st of July last, by amicable arrangement, his post as Chief Chemist to the German Continental Gas Company. He will, however, hold the position of their Technical Adviser.

The New Paris Gas Company.—Though the concession for the future gas supply of Paris was placed some time ago, certain difficulties arose which till quite recently prevented the completion of the arrangements. Everything, however, is now in order; and the Company will enter into possession on the 1st prox. The concession is for twenty years; and the price will be 20 c. per cubic metre (4s. 6d. per 1000 cubic feet), subject to reductions of not less than 0·5 c. when the profits allow of the payment of the City's share of 20,000,000 frs., and a complementary sum of 150,000 frs. to the Company. Each new consumer will have to pay a deposit equal to 5 frs. per burner, to be refunded on the service being discontinued. The charge for a 5-light meter will be 90 c. per month; the rental for larger sizes rising in proportion. The registered representative of the Company is M. Rouland, a Parisian engineer; the President of the Administrative Council is M. Adolphe Carnot, a member of the Institute of France, and formerly Director of the School of Mines; and the General Manager is M. Léon Martin.

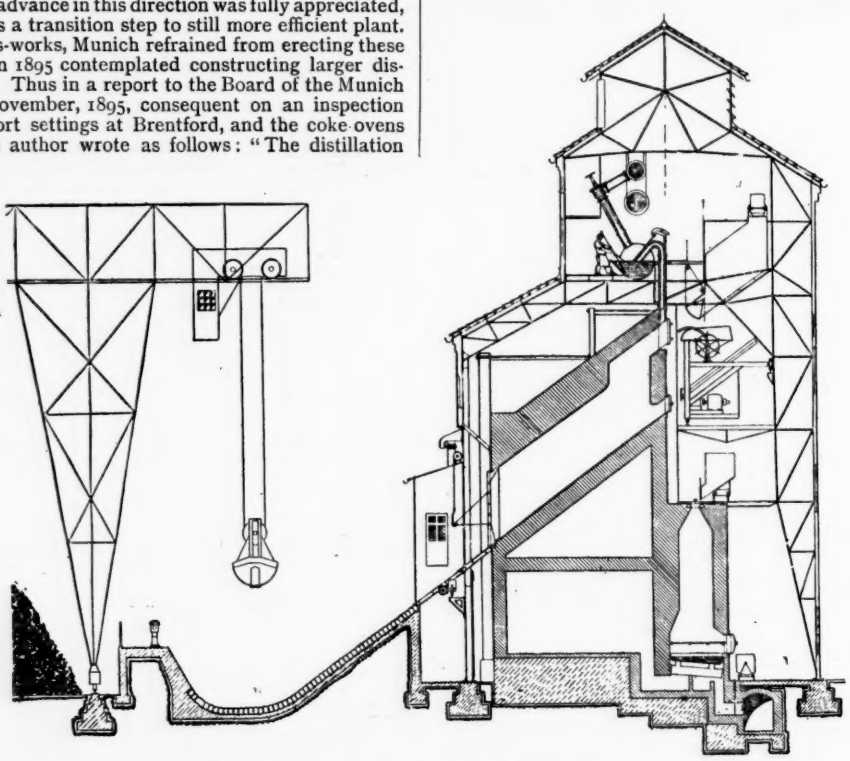
THE MUNICH CARBONIZING CHAMBERS.

THE report of the proceedings at the meeting of the German Association of Gas and Water Engineers at Mannheim, which appeared in the "JOURNAL" for June 18 last, embodied (p. 810) a summary of the communication which Herr Ries, the Manager of the Munich Gas-Works, made to the meeting with reference to the carbonizing chambers that have been in use at his works. The paper by Herr Ries and a report (not presented, though referred to at the meeting) by Dr. Bunte on behalf of the Carlsruhe Experimental Gas-Works, on the working of these carbonizers, have been published in full in the "Journal für Gasbeleuchtung" for the 3rd inst. The following abstract translation of Herr Ries' paper has been prepared by way of supplementing the particulars already given in the "JOURNAL." Dr. Bunte's report will be dealt with in a subsequent issue.

THE MUNICH CHAMBER SETTINGS.

By H. RIES, the Manager of the Munich Gas-Works.

The desire to simplify the work of carbonization has been very strong at these, as at all large gas-works. The importance of the Coze settings as an advance in this direction was fully appreciated, but was regarded as a transition step to still more efficient plant. Like many other gas-works, Munich refrained from erecting these settings, and even in 1895 contemplated constructing larger distillation chambers. Thus in a report to the Board of the Munich Gas Company in November, 1895, consequent on an inspection of the inclined retort settings at Brentford, and the coke-ovens at Dahlhausen, the author wrote as follows: "The distillation ovens of the coke-works at Dahlhausen appear to represent a type of gas-making oven which should fulfil all requirements. The difficulties which the adaptation of the coke-oven to gas-works conditions presents are not to be underrated; but, on the other hand, it does not seem impossible to combine producer firing with the chamber oven. Gas manufacture will first attain a position of greater independence of human labour and cheap working with such a system of ovens."



Cross Section of the Munich Carbonizing Chamber.

The first projects (made jointly with Dr. Schilling) for a large chamber oven date from 1896; but their realization had to be postponed, because the Gas Company had no interest in pursuing such experiments, in view of the fact that the works were to pass into the hands of the Municipality in 1899. Neither were the first few years of municipal control favourable to such researches; and hence it came about that a trial oven was not erected until 1902. The results, which were communicated in 1903 and 1904 to the Bavarian Association of Gas Managers, need not be now quoted. By repeated re-building, the oven was ultimately so designed, and such results were obtained over a prolonged period of use, that a final installation of five beds, containing in all fifteen chambers, was proceeded with. It was to take the place of six beds of eight retorts which were scheduled for breaking up. The plant, which was to be equipped at once with all the requisite coal-conveying machinery, required considerable outlay, which the Munich Corporation willingly agreed to. The completion of the work, however, was delayed many months owing to strikes and locks-out; so that actually the plant only started working on Oct. 5, 1906.

The preceding illustration shows the arrangement of the plant. Three carbonizing chambers are erected in each regenerative setting. Between the floors of the chambers, which are very massively built, are the gas-nozzles, and above these and between the chambers the heating flues, of which the upper portions pass partly over the tops and partly to the rear walls of the chambers in order that they may pass down on the other side of the chambers to the regenerator. The chambers are set at the angle which is necessary for the automatic settling of the coal and the sliding out of the coke. The closing of the doors or openings in the chambers had to be carefully effected. Gas-tight closing of the small openings on the charging side presented no difficulty; but there was much more trouble with the large discharging opening. This, however, has now been completely overcome. The charging openings are opened and closed by hand. The discharging door is operated by means of a small trolley travelling in front of the settings. In a later type this door is raised and closed by a few moves of a handle. A screen is provided on the door inside the chamber in order to prevent the coal being forced down into the discharging mouthpiece. The pressure of the coal on the door is transferred by appropriate design to the bracing of the setting. Generally the slab of coke begins at once to move downwards when the discharging door is opened; but if it needs a push, an expelling device, moving on the rear wall and easily manipulated, is used. Its head pushes the rear of the slab of coke.

A bunker, of the same capacity as the carbonizing chamber, is placed at the back of and behind the chambers, for charging them with coal. Coal is conveyed to the bunker by customary machinery; the large lumps having been broken to nuts about 4 inches in diameter. The coal is run in from the bunker to the chamber by means of a travelling tipping trough, one end of which enters the mouthpiece of the chamber, while the other is attached to the outlet of the bunker, which is provided with a flap valve. The slab of coke issuing from the chamber slides over a shoot supported by a trolley into the open. Special arrangements have not been provided for removing and quenching the coke, because the old retort-house is not well adapted for them, and also it seemed desirable first to prove the continued utility of the new chambers. A very simple and cheap plan was followed, with good results. In front of the retort-house is a pit about 13 feet wide, and 4 ft. 6 in. deep, of which the floor seen in cross-section first follows the slope of the shoot and then gradually comes to the horizontal. The slab of coke therefore coming from the carbonizing chamber breaks up at the point where the floor of the pit takes an altered direction—generally by splitting lengthwise, so that half falls to the right and half to the left.

The coke is quenched in the pit, and for the time being is removed in barrows; but ultimately, when the plant is extended to the whole of the retort-house, the manual work will be displaced by a small travelling skip. There can, of course, be no obstacle to the mechanical quenching and conveying of coke which is adopted with other systems of settings; but the very cheap arrangement mentioned seems quite suitable for a moderate scale of working.

Each setting has its own hydraulic main, entered by three wide ascension pipes. It is roomy and accessible for cleaning. The producers are on the charging side of the bench, and are sufficiently large for refilling to be required only at tolerably long intervals. The discharging and charging of a chamber take

place in this manner: The charging and the expelling openings at the charging end are opened, and then the discharging opening. If the slab of coke needs a push to start it sliding, one is given by a few turns of the winch, by means of which the pusher-head is pressed through the expelling-opening on to the upper end of the slab of coke. The latter then slides down in a few seconds into the quenching pit. The discharging door and the expelling opening are then closed, and the tipping scoop is brought to the charging opening, the slide on the outlet of the bunker is drawn, and, if the bunker is properly placed, the charging is finished within from 20 to 30 seconds—almost without any smoke or flame. The coal settles in the chamber at a uniform depth almost up to the mouthpiece. The charging opening is then closed. The discharging and charging of each chamber normally take about 3 minutes. The work requires two men on each side of the bench; and they could attend to ten to twelve settings with 30 to 36 chambers in an eight-hour shift. As the carbonizing time is 21 hours, for the rest of the day one man suffices to look after the settings and attend to the heating.

The uniform heat of the walls and bottoms of the chambers is striking, and is secured by the appropriate disposition of the gas-nozzles and the heating flues. The average temperature in the heating flues between the walls of the chambers is 1250° to 1300° C. (2280° to 2370° Fahr.); and the chimney gases leave the setting at about 350° C. (662° Fahr.). There is considerably less external radiation than with Coze settings. The whole house remains nearly free from fumes while the charging is in progress, and in this respect compares very favourably with the ordinary retort-house. Especially interesting was the behaviour, on prolonged use, of the walls and floors of the chambers where most exposed to wear and tear and the effects of heat.

The bottoms of the chambers have so far undergone no change, and show no signs of any dropping. The walls of the chambers have also behaved well, notwithstanding the fact that no special allowance was made in the existing settings to prevent sagging. Trifling deformations of single chambers, due to over-heating, which have occurred could be rectified in a short time without injury to the walls. In order to try another kind of fire-brick, however, the experiment was made of changing the wall of a chamber without taking away the mouthpiece; and the work was accomplished successfully owing to the ready accessibility of the chambers. The whole block of settings is also in good condition externally. Deflection of the comparatively weak bracings is scarcely to be observed, and in particular the sliding down of the brickwork towards the face of the bench, which occurs with Coze settings, does not take place.

Working Results.

Very much the same occurs in the chamber in the course of 24 hours' carbonization as occurs in retorts. The heat issuing from the walls first attacks from all sides the outer layer of the prism of coal, and gradually works inwards. Gasification and coking proceed by similar stages. In accordance with the duration of the heating action and the reduction of the pressure of the overlying coal, the density of the coke diminishes somewhat from outside inwards and from below upwards. The escape of the gas upwards and within the less highly-heated middle layer is thus facilitated, and the concomitant advantages secured. With all the kinds of coal so far carbonized, it has been found that the slab of coke is detached from the walls of the chamber—there being an intervening free space about ½ inch wide. This occurred almost to the same extent with Saar, Ruhr, Saxony, Bohemian, German-Silesian, and Austrian-Silesian coals, and is favourable to the ready removal of the slab of coke and the preservation of the walls of the chamber.

The deposition of carbon as scurf is smaller than with retorts for the same make of gas. Removal of the scurf is only necessary every six to seven weeks. On the walls the scurf is in thin plates, which are easily detached, and often come out with the coke. On the upper part, it forms a thicker and harder layer, filling up the angles; and this has to be removed by burning off. The latter procedure may, however, be considerably postponed if the carbon deposits are removed by rubbing with a scraper before each charge while they are still flaky and soft.

The working results obtained in November last year indicated that the expectations derived from the earlier trial-settings were being fulfilled; but before proceeding to any extension of the system, it was desired to have an authoritative report on the settings. Dr. Bunte undertook to furnish this through the Instructional and Experimental Works of the German Association of Gas and Water Engineers; and an accurate investigation of the settings was carried out from the 7th to the 16th of February under his personal supervision. The investigation was made on three settings, and consequently nine chambers, with Saar coal. It was made in two series. In one the chambers were all charged at about the same time, so that the true course of the distillation process over the 24 hours' carbonizing period could be observed in detail. In the other series, the chambers were charged at the usual working intervals; and 24-hour periods were taken for the observations.

The details of the arrangements for the investigation need not be referred to by the author; it will suffice to say that they were very interesting, and involved an immense amount of labour on the part of Dr. Bunte and his collaborateurs. He has only found it possible so far to deal with the more important experimental results; and these form the subject of a provisional report which is being published co-temporaneously with this paper. [A summary of the results has, however, already been given in the "Journal" for June 18, p. 810.] Briefly it may here merely be pointed out that the yield of gas averaged in the seven trials 11,784 cubic feet per ton of Saar coal.

The evolution of the gas from the chambers at the several stages of distillation is very uniform. The production rises rapidly in the first half hour after charging, then falls off slightly for the next three hours, and continues from that time to about 18 hours at nearly the same rate. There is then a steady fall to the minimum at 24 hours. The illuminating power of the gas follows a similar curve to the make. In the first half hour it attains its maximum of 27 to 30 Hefners (24½ to 27¼ candles), then falls uniformly during the next three hours to approximately the average value, which is maintained for a long time, though there is a regular drop towards the end of the distillation. [According to Dr. Bunte's report, the illuminating powers referred to are the values of the gas when tested in a slit or batswing burner at the rate of 150 litres (5·3 cubic feet) per hour.] The calorific power and the specific gravity of the gas are also at a maximum in the first hour, and fall off by uniform small drops to their lowest values at the end of the period of carbonization. The curves for make and quality naturally depend primarily on the temperature of carbonization, and the consequent duration of that process. The higher the temperature, the greater is the make of gas at the expense of its illuminating and calorific values. It is therefore open to us to make either a normal quantity of gas of high quality or a large quantity of lower quality. As a rule, for practical reasons the heats of the settings will be so accommodated to the relative ease of gasification of the various kinds of coal that the process will not be completed much earlier or later than 24 hours from the time of charging. Thus the arrangement of the shifts of workmen will continue unaltered, and excessive expenditure of fuel will be avoided.

The yield of coke with Saar coal amounts to about 67 per cent. of the weight of coal. The coke is in large lumps, somewhat harder and denser than retort coke, but not so dense that its use in domestic stoves would present any difficulty. The breeze only amounts to 1·8 per cent. The quantity of tar is about 6·1 per cent. of the weight of coal, and of ammoniacal liquor about 7·3 per cent. On an average, coke amounting to 15·32 per cent. of the weight of coal carbonized was used as fuel for heating the settings; but this consumption may still be reduced. With larger carbonizing chambers, it should be still more favourable. Dr. Bunte's results on the yield of ammonia and cyanogen are not yet fully presented; but there appears to be a considerable increase in the yield of ammonia, and a diminution of the cyanogen.

A make from Saar coal of nearly 11,800 cubic feet of gas per ton, with a gross calorific value of 662 B.Th.U. per cubic foot, an illuminating power of 10 to 11 candles with a slit burner at the rate of 5·3 cubic feet per hour, and a make of bye-products equal to, and even in many respects quantitatively and qualitatively better than, retort practice, must all be admitted as results which can be economically attained with the large chamber setting. It has been further established in experiments with the first settings that the make of gas can be considerably increased by introducing steam into the chambers during the last few hours of carbonization; but the results of recent trials of this procedure are not available. Some are about to be made. The working of the chamber settings has so far been entirely satisfactory, and has displayed the simplification which was aimed at. The retort-house, with its noise and reek night and day, has become a quiet and airy building, with only one man in attendance after charging is finished.

The five chamber settings at the Munich works make from 14,000 to 15,000 cubic metres (say 495,000 to 530,000 cubic feet) of gas per diem, or from 2800 to 3000 cubic metres (about 99,000 to 106,000 cubic feet) per setting. They were built of a size to afford this make. They are united in one bench, which is nearly 67 feet long, 15¼ feet deep and 34¾ feet high. The height could be readily reduced by from 3 to 5 feet by the adoption of a more efficient system of regeneration; it was determined in the present case by the existing retort-house conditions. The five producers stand in front of the bench on the charging side, and are 6·56 feet long, 7·2 feet wide, and 13·45 feet high. Each carbonizing chamber holds from 2½ to 3 tons of coal; but there would be no difficulty in making, under the same method of construction, settings having any productive capacity up to 6000 cubic metres (212,000 cubic feet) per diem. The dimensions of benches of five settings of larger productive capacity would be approximately as shown in the following table:—

Make per Setting per Diem.		Bench.		Five Producers.		Average Height of Settings in Feet.
Cubic Metres.	Cubic Feet.	Length. Feet.	Depth. Feet.	Length. Feet.	Depth. Feet.	
3000	106,000	72½	15·1	6·23	7·22	29·2
4000	141,000	,,	17·1	6·89	7·54	32·5
5000	176,000	,,	19·3	7·87	7·54	36·1
6000	212,000	,,	21·0	7·87	7·54	39·0

The productive capacity per diem per square foot of area comes out about as follows:—

Gas Made per Setting per Diem.	Per Square Foot Area of Setting.	Per Square Foot Area of Retort (Chamber)-House.
Cubic Feet.	Cubic Feet.	Cubic Feet.
106,000	427	164
141,000	492	213
176,000	558	262
212,000	623	295

The height of the house from the floor of the producer to the principal truss would be 40 to 50 feet, according to the size of the settings; and the width 36 to 46 feet. It need not be further explained that the ground space for the building and the coal-bunkers could be much economized by putting in one house two rows of settings with the charging sides facing one another. Owing to the relatively small heat radiation and the easy work, such an arrangement would prove more satisfactory with the chambers than with Coze settings.

Economy of the Chamber Settings.

The five existing settings have required two stokers on each side of the bench; and the charging of the fifteen chambers occupies these four men about three hours. With an arrangement for removing the coke more rapidly, the four stokers could doubtless attend to twelve settings in an eight-hour shift; thus the daily make per man per eight-hour shift would be 318,000 cubic feet, or with larger settings more—viz., for the 141,000 cubic feet per diem settings 424,000 cubic feet, for the 176,000 cubic feet settings 530,000 cubic feet, and for the 212,000 cubic feet settings 635,000 cubic feet. The maintenance of the settings during the eight months' working, comprising 1059 setting-days, with a make of 106 million cubic feet of chamber gas, has not presented any special requirements, and no repairs or renewals have been needed with those settings which have been continuously at work for that time. This leads to the conclusion that the chambers will last much longer than retorts, and that the cost of maintenance of the chamber settings will be much lower than that of retort-settings. The economy is, of course, greater the more regularly the year through the chamber settings can be worked in such numbers as to keep the staff of stokers fully employed, and if the accessory machinery is relatively well occupied.

The most prominent advantage of the large chamber settings lies, however, in the labour conditions. The number of men employed is reduced to a minimum. A house containing twelve chamber settings, and having, therefore, a productive capacity, according to their size, of from 36,000 to 72,000 cubic metres (1,270,000 to 2,540,000 cubic feet) per diem, requires for charging and discharging only three or four men for eight hours; whereas fifteen to thirty would be employed day and night for a similar production with horizontal retorts. Night work can be done away with, except for a watchman, who can also attend to the producers. The conditions are also lighter and hygienically far superior. All these advantages have been quite clearly demonstrated by the working of five chamber settings at Munich, though these are not so complete in some respects as later experience indicates they should be. A longer time is required in all such cases for full development.

(To be continued.)

THE BUEB VERTICAL RETORTS AT COLOGNE AND OBERSPREE (BERLIN).

Remarks of Mr. E. Korting.

It has already been reported in our columns that after Herr Prenger, the Manager of the Cologne Gas-Works, had described the installation of vertical retorts at those works before the recent meeting of the German Association of Gas and Water Engineers,* Mr. E. Körting, the Manager of the Imperial Continental Gas Association's works at Berlin, made some observations on the working of vertical retorts. His remarks have now been published *in extenso* in the "Journal für Gasbeleuchtung;" and we may appropriately supplement the earlier brief report by quoting from our German contemporary.

Mr. Körting said he had several times seen the beautiful installation of vertical retorts at Cologne; and it was as carefully thought out and comprehensively planned as everything on Herr Prenger's wonderful works. They all regretted that as yet no working results were available. He could, however, present some from the Oberspree works at Berlin. It was necessary to bear in mind that he who took part in working a new invention came under the suspicion of always looking at its results through rose-coloured glasses. However, he hoped to recover the confidence of his hearers when he stated that the results now achieved on the large scale were considerably more favourable than those he had previously published for the trial settings. In any case, he had now proof that he had nothing to withdraw from what he had said in regard to the latter.

* See "Journal," Vol. XCVIII., pp. 810, 1000.

The Oberspree works were only small. This was advantageous, as they had thus been able to work there for several months past entirely with vertical retorts, and so obtain as precise results as possible. The works, however, were not large enough for them to have there either an academically trained engineer or a chemist. The units also were far too large. All these things were naturally unfavourable to the results. Nevertheless, the fact that the installation had so far given him nothing but satisfaction was decidedly a proof of the trustworthiness of the working of the settings of verticals. A great number of different coals were used at the Oberspree works. In order, however, to give results from a known variety of coal, he had made a nine-days' trial with Westphalian coal (Hibernia and Wilhelmine Viktoria). On an average, they had obtained from 100 kilos. of this coal 37 cubic metres (or 13,277 cubic feet per ton) of gas, having a calorific power of 592 B.Th.U. per cubic foot. The make per retort per diem exceeded 14,833 cubic feet. The make of tar, on the average of two months, was 5 per cent. of the weight of coal; the ammonia, 0·36 per cent.; and 54 per cent. of coke remained available for sale.

These results were all that had been expected; and he could assure his audience that the financial results were in keeping with them. He would not enter into details; it would suffice to say that in May last the small Oberspree works did considerably better than the average of all the rest of the large Berlin works of his Association. The big installation at Mariendorf, which would come into operation in the autumn, was exactly on the same lines as that at Oberspree.

The rest of Mr. Körting's remarks referred to his paper on the "Vertical Retort-House at Oberspree," of which a translation was given in the "Journal" for the 18th of June last (p. 804). But in reply to an inquiry as to whether the yield of 37 cubic metres per 100 kilos. had been obtained with or without the introduction of steam into the retorts, he stated that it was with steam.

GAS PRICES IN AMERICA.

Very full statistics with reference to the prices charged for gas in the United States have been compiled by the Milwaukee Gaslight Company, and printed in book form. The principal cities are included; and the prices (which are from data received from the respective gas companies) are given for each year from 1885 to 1907 inclusive. The extent of the information afforded may be gathered from the fact that over 160 towns are tabulated. In each case, the figures given are either a uniform price for all gas used regardless of the purpose for which it is employed, or the separate charges made for illuminating gas and fuel gas. In addition to this, there are in so many instances special prices or unusual conditions in force, that no less than 80 of the undertakings have explanatory references accorded to them at the end of the book.

A great amount of trouble must have been expended on the collection and setting forth of the information; but the labour cannot be regarded as ill-spent. Perhaps of more particular general interest is the final table, which contains a list of cities of 25,000 or more population in which gas is being sold in the present year at $1 or less per 1000 cubic feet, for all purposes or for any particular purpose. There are three cases in which the price is 50 c.—Cincinnati, for fuel only, to keep out natural gas (the sales, it is stated, are very small); Detroit, for consumptions over 200,000 cubic feet; and Hamilton, for over 100,000 feet. A price of 60 c. is charged at Detroit, for the second 100,000 cubic feet; at Hamilton, for consumptions of 10,000 to 100,000 feet; at Kingston, for over 100,000 feet; at Milwaukee, for over 20,000 feet; at Racine, for over 30,000 feet for fuel; and at San Francisco, for over 75,000 feet. Under the heading of 65 c., San Francisco alone figures—this charge being made for consumptions of 40,000 to 75,000 cubic feet. At 70 c., we have again Detroit, for the second 50,000 cubic feet consumed; Kingston, for 50,000 to 100,000 feet; Milwaukee, for the second 10,000 feet; and San Francisco, for 30,000 to 40,000 feet. This price is also charged at Toledo for gas used as fuel. The next division—75 c.—comprises the price charged at Cincinnati for light; and there are three instances in which all gas used is supplied at this rate—Cleveland, Duluth, and Wheeling. Thereafter, the sections become longer, until we find that $1 is charged for all or some purposes in 34 towns of the size dealt with in the table.

In the case of New York City, a note is appended that the State Legislature fixed the price of gas at 80 c. per 1000 cubic feet to the public and 75 c. per 1000 feet to the Municipality—such rates to go into effect on May 1, 1906. An appeal from this legislative enactment, alleging unconstitutionality, &c., is now pending in the United States Court. In the meantime, the Companies are charging the public, and collecting, $1 per 1000 cubic feet.

Acting on the recommendation of the Gas Committee, the Newcastle-under-Lyme Town Council have appointed Mr. E. C. Baskeyfield Gas Manager, as successor to the late Mr. W. Winstanley. It will be called to mind that, in May last, it was resolved that Mr. Baskeyfield, who was at the time Secretary to the Gas Department, should have control of the works for the following three months. The salary is £200 per annum, with house, rates, coal, and gas; and Mr. Baskeyfield will be acting as Secretary as well as Manager.

IRISH ASSOCIATION OF GAS MANAGERS.

PRESIDENTIAL ADDRESS

AT THE

ANNUAL GENERAL MEETING IN DUBLIN,

AUG. 13,

By T. J. Reid, of Ballina.

Gentlemen,—In acknowledging for the second time my indebtedness to you for having appointed me your President, I do so not without a certain amount of grim admiration for the custom which has ordained that the Presidential Address should be delivered on the occasion which marks the termination of his year of office, rather than on that which saw his exaltation to high estate. Excellent as this custom is, it bears the impress of slow evolution from the period when the chosen of the multitude harangued his hearers while his honours were yet thick upon him, and his garb of office had not begun to lose that power to induce the mental condition variously described, and which has lately been styled "exaggerated ego." I have no doubt that experience proving how small a ratio such utterances bore to actual performance soon demanded that performance should precede harangue. The wisdom of this arrangement cannot be questioned as ensuring that at least something should be attempted and accomplished which would pass muster against the day of reckoning that such an occasion as this provides. Should my feelings at the beginning of my year of office have been anything such as I have hinted at, you may have the gratification of knowing that they have long since evaporated.

Dealing first of all with the affairs of the Association, and turning to the events which have transpired since I took up the reins of office, the event which calls at once for particular notice is the visit of the Institution of Gas Engineers to this city, and the extremely magnanimous and tactful way in which it recognized our existence and extended to us the utmost and most generous hospitality, of which, I am glad to say, a number of us partook with benefit to ourselves and ultimately, I trust, to the Institution of Gas Engineers, by adding new members to its roll. It could not have been without some good result to be present at the meeting and make closer acquaintance with the men in the forefront of our profession, on whose efforts our welfare and the future of the gas industry may to a large extent depend; for, situated as we are in this country, it is only in the nature of things that we must look to our brethren elsewhere for the essential improvements in our methods which may be regarded as necessary in order that we may retain our present position as the purveyors of light, power, or heat. It is a matter of gratification to me, notwithstanding the fears that were expressed that our meeting would be overshadowed by the Institution meeting—indeed, it had been suggested that we should not hold a meeting this year—to see that so many of our members have formed a higher conception of their duty, not thinking it too great a sacrifice to come here after such a short interval. This is only as it should be; for while we may look to others for guidance and counsel, yet we should allow no consideration to destroy the integrity of our own Association, or admit anything as an excuse for not working out our own salvation in our own peculiar fashion to the best of our ability.

This, I think, is only a proper estimation of our duty to ourselves; and, in this regard, I may be permitted to express the hope that those of our members who are also members of District Associations will see to it that their duty be first of all to this Association, and that no selfish or disloyal motives be allowed to alienate any of that support which would otherwise have been accorded to the Association, or abate for one moment the individual enthusiasm and zeal which every member ought to feel for its welfare. There is nothing whatever incompatible in both Associations pursuing their courses each of mutual support to the other; but occasions will arise when only the practice of a little self-denial will ensure the best interests of this Association receiving premier consideration. I am sure you will pardon my dwelling with perhaps unnecessary persistency on what may be a very improbable eventuality; but a word in time can do no harm, if only it serves to draw attention for a moment to what may be considered a potential source of danger.

Out of this question arises the thought: "What is the necessity for District Associations?" the most obvious solution being that members in a limited area can more readily, and consequently more frequently, meet together to discuss every-day matters which might not be considered of sufficient importance to form part of the programme of the larger meeting. This is all very well. But does not this cause the disqueting suspicion that perchance our Association is not the best adapted to suit the wants of its members, and that the work which it should perform is being relegated to the District Associations? Let us see how far such an insinuation may be true. We have more or less followed on the lines of larger Associations, principally composed, however, of members who are in charge of comparatively large works; and therefore the papers likely to be discussed deal in the main with the more advanced concerns of the gas profession, and so the existence of District Associations for the purpose of mutual help and the discussion of more every-day topics is right and natural. In Ireland, the situation is quite different. The vast majority of our members are interested in works of no great size; and it might be possible that the necessity which evidently exists for District Associations is born from a want, in our failing to supply mental fare suited to our requirements, rather than from a voracious desire for further mental *pabulum*.

Now, I have often considered whether the good accomplished by our Association might not be greatly enhanced, and the proceedings made more interesting and practically useful, by combining the best features of the Central and District Associations—the introduction of discussion on more ordinary topics, the institution of the "Question-Box," the consideration of matters commercial, or any other features that might awaken a more active interest in a number of our members, who, for one reason or another, do not take a sufficiently prominent part in our meetings. The "Question-Box" we may look askance upon; but the mere fact that week after week a portion of the "Gas World" is devoted to replies to queries—not of a very abstruse nature—is proof that information is lacking among some section of the gas profession which the "Question-Box" might supply.

I am not in favour of revolutionary changes, nor am I condemning the work of our Association in the past, which has been excellent, and such as its founders may well be proud of. But it is borne in upon me that a feeling does exist—more or less nebulous, perhaps—that the actual good resulting from our Association meetings is not adequate for the amount of labour involved. Certainly the yearly increasing difficulty our Secretary experiences in getting members to submit suitable papers, and the meagre discussion these papers are accorded, principally from a very limited number indeed of those present at our assemblies, points to the inevitable conclusion that some change is desirable which no mistaken sense of dignity should prevent us making. If we could only persuade those members who are so capable of conducting a discussion through the medium of the Technical Press to reserve some of their efforts for our own meetings, they would not lose any of their value, and would assuredly heighten the interest in our proceedings. We must never get away from the fact that we are a small Association of managers of small works; and, keeping this in mind, we should endeavour not to miss any point which would make the Association indispensable to them.

Nothing in the foregoing remarks takes account of the material advantages which may, and do, accrue from members united in one body, which would be quite reason enough were there no other why every person connected with the management of gas-works in Ireland should consider it his duty to be a member of the Association. Looking over the membership roll, it is surprising to note how many omissions are to be filled up before we can say that all our brethren properly appreciate the good which membership of the Association might do them. Out of about 114 gas concerns in Ireland, there are only some 65 represented in the Association. This can scarcely be considered a fair percentage; and steps should be taken to remedy this state of things. I do not think such apparent apathy arises from selfishness. Perhaps it may be found in some want in our own organization. The majority of the gas-works are small; and, as I have already insisted, it is just among such undertakings that our work must principally lie.

Here let me correct a misconception which seems to exist in the minds of some of the public as to the objects of our Association. They not unnaturally associate them with the ventilation of personal grievances. But possibly, were it more generally understood that our deliberations are entirely directed towards improving our methods, with a view to cheapening and popularizing a commodity of such public utility as gas, they would enlist greater public interest. It is not too much to suggest that we should meet with more appreciation from those interested in gas undertakings, whether as committeemen or as directors, by their seeing that their managers are encouraged to attend our meetings, and are provided with the means of doing so. I also note with regret that very few of the larger works are represented. This is not as it should be; for, even if those concerned harbour the thought that they could reap no possible benefit from membership of an Association where the minor concerns of the gas industry must ever predominate, it is equally true that being in such a position bestows the privilege—which in this instance is not less a duty—of sharing with their brethren who are less liberally endowed some of the fruits of their riper knowledge and experience.

Having dealt with the position of our Association as it commends itself to me, I will now direct my remarks to the ordinary affairs of our profession. Foremost among these I would place the commercial and financial interests, which determine to a greater degree than any other the prosperity or otherwise of our undertakings. Necessity has long forced on small gas undertakings the responsibility of carrying out the supply of gas to the point of combustion. Indeed, we have been involuntary pioneers in the commercial policy now adopted by most large gas concerns in getting into absolute touch with their consumers, and which is forcibly exemplified in the code of rules issued to the Gaslight and Coke Company's fitters, which has as its whole theme the pleasing of the consumer and convincing him that the Company are not wholly concerned in extracting "gas money" from him. These rules are admirable in the case of the Company issuing them, and are suitable for fairly large works; but you will readily

appreciate the feelings of one of our fitters if presented with a copy and told he must conform to such rules. However, it marks the change which the new commercial policy has produced in the attitude of producer to consumer. What is merely a "policy" to others, is a necessity to us. We have so long been called upon to gratuitously perform those little adjustments of burners and repairs of leakages, and the dozen other minor attentions to the consumer's fittings usually expressed by him in the uniform phrase "Something wrong with the gas," that we have come to be held actually responsible by him for every service necessary to the use of gas. We may have often had reason to cavil at the additional burden thus thrust upon us; but I claim that our success is directly attributable to the fact that we have been in the position of knowing and catering for our consumers' wants before they had reached an advanced stage.

Coincident with the life of our Association, and no doubt influenced thereby, a remarkable levelling-up of our works and managers has to be recorded. The improvement in ourselves is perhaps more noticeable than in our works, and, indeed, the totally changed conditions of methods for conveying gas and the various improvements in manufacture demand a much higher order of intelligence than would have sufficed years ago. Furthermore, the manager of a small gas-works in Ireland—owing to the isolated position in which it is placed, and in which he cannot quickly avail himself of more expert assistance—should be a man of greater resource than would be required in a works more favourably situated. The different conditions prevailing in our small towns require the provision of an outdoor department, which in a town of similar size in England might not be so much required, owing to the towns being more self-centred—in fact, embryo cities. The demands upon our resources are of a varied character, as we are called upon to supply the varied necessities of all classes of consumers—including the man who cannot understand why he cannot get gas at the same price as in Widnes.

The mere fact that all the materials which we require in manufacture have to be conveyed such long distances, necessitates our having a commercial knowledge of freights, chartering, &c.; and the actual purchasing of the materials themselves warrants the possession of some business training. In short, in both the manufacturing and selling sides of our smallest concerns the art of buying and selling is a necessary accomplishment. In our manufacturing department a commercial knowledge will be brought to bear on the purchase of the various raw materials and manufactured articles we have to deal with—including such commodities as coal and mantles; while in our selling department how to find the best market for our coke and our tar will test our best efforts, and, indeed, the disposal of the latter within recent years has become a serious problem which is claiming attention from our highest intellects.

Here let me interject that, while we are awaiting the results of tar-spraying experiments on our roads, we may do something to encourage the use of tar as a preservative for the iron roofs which have displaced the timber constructions of other years. I have found by experiment that tar properly applied to roofs of the former material compares favourably with the best paint, and, of course, at much less cost. In recent years, it has become fashionable to paint all our ironwork instead of tarring it. We seem to have the idea that tar as a preservative is out of date, and that if we would preserve our self-respect as well as our holders we must taboo its use. Now, I am not competent to say authoritatively that tar is as good as paint; but we can all point to plant in use for half-a-century still in good condition which owes its preservation to tar. I noted with interest, when visiting one of the large English works remarkable for the low price at which it sells gas, that the æsthetic taste, or whatever it may be, which influences some of us to eschew plain tar had no consideration there, as tar was used as a holder preservative.

In advocating the adoption of a commercial policy in the conduct of our small concerns, I do not for one moment wish it to be understood that it is always wise to embark on wholesale schemes of slot and cooker installations, free incandescent burners, or any of the more advanced methods for increasing consumption. In fact, I would insist that it is often commercially a sounder policy not to touch this sort of thing at all; and at all times we should be chary in adopting schemes of any sort because they are considered up-to-date. A wise discrimination should be exercised in approaching matters of this sort, whether they concern expenditure on our manufacturing or selling departments. Our operations are on too small a scale to cover up any mistakes we may make; but I am afraid that money is often spent on unremunerative work which a sounder knowledge of finance, or a little less seeking after the "bubble reputation," would not have occasioned. In these matters, everyone must judge for himself; and while reasonably enterprising, one should balance any desire to raise a monument to his own ambition (at others' expense) by asking the question, "Would I do this were it my own?"

In any question touching consumers the selling price of gas is, of course, important; and in this respect I think we should not be hidebound by accepted ideas. It is quite a moot point as to whether it is wiser to sell our gas at the lowest uniform rate or adopt differential prices. I am distinctly in favour of differential prices, if only as a means to an end; and I would even go further than this and advocate the adoption of the railway policy of "charging only what the traffic will bear." I have put this into practice by charging a smaller price to slot consumers than to ordinary consumers. This may seem contrary to all common sense; but it is only anomalous when compared with what would be considered good business elsewhere. A low selling price is eminently desirable from all points of view; but I would not set it up as a fetish to be worshipped in preference to all else. It can be easily shown that if a certain financial policy is adopted, it would be possible to sell gas at any price; and I claim that such a policy is not good finance. It is only fair that our income should be such as will pay a decent dividend on the real capital value of our concerns. If this were the case, I wonder how many works in Ireland would be able to maintain their present price of gas. As a matter of fact, as pointed out by our President of last year, Mr. R. Bruce Anderson, in his address, capital outlay has been derived from revenue to such an extent that many of our works are only paying a dividend on their original capital value, and in some cases on even less.

Altogether apart from this bearing of the question, I doubt the wisdom of a low price policy as against a slightly higher price, and looking after the consumers better. We may sneer at the "Given away with a pound of tea" system of gas sales; but observation of human nature in relation to matters of this sort compels me to admit the practical success attending such methods. We must remember that we can only sell a certain amount of gas, no matter what the price is. In our towns with diminishing populations, we cannot look forward to annually recurring increases of 5 per cent., which is the average increase arising from the natural expansion of towns across the water; and therefore sooner or later we must reach the saturation point.

Questions of finance often hinder our progress in the furtherance of those schemes for increasing output to which I have already alluded. The same considerations often stand in the way of the erection of manufacturing plant when doing so would be amply justified were we in the position for raising new capital which is enjoyed by works elsewhere. There is no doubt that there are many gas concerns languishing from the impossibility of raising necessary capital at a fair amount of interest, and must continue to do so until the modern financier comes along and imbues them with new life. It is a dismal fact that it is harder to borrow on the security of an Irish gas-works than were it elsewhere. Both banks and public alike look upon gas investments as unsafe, and would sooner embark their money in some hare-brained scheme to electrify a country side than put a penny into a steady-going concern. Here, again, the capital amount on which dividend is paid is a factor in an unfairly low estimation being arrived at as to the security offered.

Under such conditions, where capital expenditure is paid out of revenue, the enterprising manager, bent on increasing his output, is sometimes pulled up by the tantalizing fact that he must balance his capital outlay and revenue, and stay his efforts for a time, and may never be able to resume them under such favourable conditions. Take, for instance, the case of a works which has been allowed to "run down." The new manager seeks to better things by first of all putting the retort-bench in modern condition; and then he starts to develop the consumption, and finds results successful to the extent that storage capacity is insufficient. All available capital being gone, he must now wait until he has earned the price of a new holder; and thus he has to put a stay on his work of development when it is in need of greater impetus.

There is undoubtedly a splendid field for the investment of Irish money in Irish gas concerns; but if the Irish public continue to await the new era, when everything will be done by the agency of a river, a dynamo, and a bit of wire, they can only blame themselves if English investors, profiting by experience, put their money into our prosaic business. This absolute faith in the possibilities of electricity on the part of our public is one of the things it is impossible to explain. They are quite convinced that it must be cheaper than gas, all evidences to the contrary notwithstanding; and this feeling acts as a deterrent on their gas consumption. Even the visitor to Liverpool will come back with the notion that all the streets are lighted by electricity; and it would be almost impossible to convince him that there are over 18,000 gas-lamps in the city. This is accounted for by the fact that the average visitor to a strange city frequents only the principal streets, where electric arc lamps are in use; and he becomes imbued with the idea that all the streets are similarly lighted, and comes home determined to see his village up-to-date in this respect.

Now this should point a moral for us—that we should make our street lighting the advertisement which it can be if carried out in a thorough manner. To do this it is, of course, necessary that we should have entire control of the lighting, as the average urban authority will not perform the work in the manner we should like. Good lamps of copper—properly designed by a gas engineer rather than by a tinker—are essential. Good incandescent burners that possess more stamina than the usual type are desirable; and, above all, vigorous attention to maintenance. It may sometimes be advisable to do the street lighting at less than cost, so as to preclude the possibility of competition from other sources being introduced, and also to thwart the socialistic aspirations of some of our latter-day urban rulers, who are fond of making the gas question a talking point in their crusade against anything that has dared to exist previous to their time. It is often easier and more expedient to reduce the price for public lighting than reduce the price to private consumers.

Together with the maintenance of street-lamp burners and mantles, something in this way ought to be done for consumers. Indeed, I find it necessary to do all this work free (only charging for materials), as the average consumer will not trouble to give attention to his incandescent burners; nor does he possess the knowledge which such attention requires. This want of knowledge is not confined to the Provinces. When last in Dublin I entered a chemist's shop in a principal thoroughfare and found the air supply to a "Block" burner covered with stamp paper. I trust that Mr. Cotton will forgive me for having adopted the rôle of his fittings inspector for the nonce, in showing that dispenser of drugs that the gas-adjusting nipple was screwed home, and suggesting that the headache of which he complained was due to his want of acquaintance with the principles of the bunsen tube rather than from "bad gas" meted out to the unfortunate citizens of Dublin.

Having devoted so much time to the commercial side of our business, I cannot say as much as I should like regarding the manufacturing side, and can only touch on a few phases of the subject. Before doing so, however, I wish to make a few remarks regarding the coal question, which, always an important one, has this year assumed alarming proportions. The phenomenal rise in price which ushered in the spring most of us fancied would give way as the summer advanced. But, unfortunately, this has been otherwise; and, I dare say, most of us have contracted at advances of 2s. 6d. to 4s. per ton on last year's prices. This means a very serious situation indeed, only lessened by the knowledge that the increase does not bear as high a proportion to our selling price of gas per 1000 cubic feet as would be the case were we nearer the pits.

Into the various causes assigned for the increase in price it can do no good to follow. It matters not to us whether this has been occasioned by better trade in England and Scotland, which we have so often to philosophically accept as a sufficient reason for advances in all sorts of goods, the while we vainly wish we were sharing in the enhanced gas sales which such brisker trade engenders, or whether a large foreign demand following on the abolition of the coal-tax has put up the price. But we in Ireland would be more than human did we not indulge in the socialistic hope that such an important national asset should be under State control, with universal rates to all parts of the kingdom.

Leaving on one side the matter of coal prices in this abnormal year, I think the whole question of coal purchase demands serious and concentrated attention on the part of the gas industry as a whole. Most of us have to complain of the manner in which the term "screened" is interpreted by collieries when applied to gas coal. It would appear that this is not quite the same when house coal is signified, and would lead to the conclusion that house coal is better screened than gas coal. At all events, the amount of slack which reaches us cannot be accounted for in any other way than by assuming that the screening was not so effectively done as it might be. The fact, too, that it is impossible to buy unscreened gas coals of good coking qualities may be important as shedding some light on this matter.

I think there might, with advantage, be more reciprocity among gas concerns in all such matters as buying and selling. We see combinations effected in the firms supplying all our various requirements, and it cannot be imagined that our interests were wholly considered. It would not therefore be too much to assume that whatever advantages accrue to suppliers from combination might equally be experienced by gas concerns, as purchasers, adopting similar methods. There is far too much aloofness in the commercial relationship of gas concerns one to another. The manager who will go out of his way to give his brethren the benefit of any improved manufacturing methods he may have discovered, will jealously guard information of a commercial nature which might be of considerable benefit to others, the disclosure of which could not be detrimental to himself or the interests with which he is charged. In countless ways would the cause of the gas industry be furthered and strengthened were we all united. There are few industries of the magnitude of ours which have not combined in some shape or form to maintain their position. In this respect we have lagged behind; and it is high time that whatever stands in the way should be brushed aside, and so allow the primitive sentiment of self-preservation to receive due consideration.

Slack or small coal is being largely used in many works favourably situated as regards carriage from the pits, which latter consideration precludes its use in our works. It is possible, however, to purchase slack at from 7s. to 10s. per ton from local coal merchants; and in this way I am able to use about 30 per cent. of slack with satisfactory results.

A great many of the improvements which have been made in gas-works practice have had some connection with improved carbonizing methods. Many of these can only possess academic interest for us. The installation of any kind of machinery except of the simplest description is beyond us, and the shovel and the barrow must still retain their position. It is for this reason that the changes in our retort-houses are few, and mainly consist in improved settings on the regenerative or generator system, which can, with advantage, be installed in the smallest works. I do not think the perfect shallow-type setting has yet been designed. Of course, it is not expected that as low a fuel-consumption can be attained with shallow as with full-depth settings; but the chief difference, to my mind, is the much greater wear and tear in producers and ironwork of the former type, and the greater amount of clinkering necessary. It may be that the future development of the vertical retort—combined, perhaps, with some method of using the heat of the issuing coke in the production of water gas—may give us the opportunity of making radical changes in our retort-houses.

In our small operations the number of retorts in a setting is important, considered in relation to our maximum make; and it often occurs that an additional retort in a setting would obviate the necessity of keeping two beds in action. Again, the number of retorts in action decides the minimum storage which will suffice; and often the keeping of another setting in action may be justified by the gas storage that is required. These considerations must be weighed together, and only possess importance in works where one retort more or less affects the situation materially. The improvements in our works may not be so noticeable to those who only know them as they are; but, contrasted with what they were twenty years ago, they show considerable advancement. Time was when a small gas-works was an ideal place to enjoy complete repose—a veritable garden of sleep, where the stoker only dissociated himself from the coal heap to put in an occasional charge, and the manager was only awakened into energy when the holder was low. The amount of heat then produced was in contrast to the unaccountably low heat of the retorts. The only animated period of the day was the evening, when the retort-house became the Local Parliament, where discussion sometimes ran high, and the charging shovel and clinkering bar were introduced to drive home some argument. But those times are gone, and only the associations remain. Our works are now generally well equipped to meet the increased demand we have all experienced; and the period of animation extends to every hour of the day and night.

We are all anxious, of course, to show a good yield of gas from our coal; and in trying to obtain such result we have doubtless experienced the disastrous effect of "stretching" the make by maintaining too great a vacuum in our retorts. Now, as to the wisdom of deliberately admitting producer gas into our holders, I am not quite prepared to give a definite opinion; but as a compromise I would admit the advisability of maintaining a slight vacuum in our retorts. In doing so, we may possibly cause small quantities of producer gas to be drawn in, but we also prevent the leakage of a similar quantity of coal gas, which would have occurred had there been the same amount of back-pressure instead. Therefore, our make gains to the extent of the added amounts of coal gas saved and producer gas admitted. Consequently, I am prepared to admit the advisability of the introduction of producer gas to the extent which ensures that no coal gas has been lost through the pores of our retorts—which ideal conditions are only obtained by strict attention to the hydraulic main and the exhauster. Latterly, a governor has been introduced on the foul mains, to correct irregularities in the work of both. While not taking up a decided position on this question of "coal gas *cum* producer gas," I do not think the storm of pious wrath which greeted its advocacy was altogether justified. It appeared to me that its opponents' sense of morality did not allow them to judge of its merits as a manufacturing process. The objections urged against it on moral grounds were not very clearly defined. They were chiefly based on an imagined injustice to the consumer; and I must openly confess to a moral obliquity which renders me incapable of seeing exactly where this injustice was. If we take up our position as suppliers of light and heat, it seems to me that the real test is the cost at which we can supply these to the consumer; and it is fatuous to argue that an injury is being done him because of the medium through which this is effected. The consumer is only concerned in the price at which he obtains light and heat, other things being equal.

I may here relate an experience I had during a period of flood, when the water reached over the fire-bars of a generator setting, the retorts of which were in a very leaky condition. Retiring to rest in the very early hours (after an anxious night, with spirits as low as the heats and holder), I gave the stoker strict instructions to "have the holder up somehow." He carried out his instructions certainly, as on rising I found the holder "blowing." With some misgivings, I went to the "photometer," which, in our case, is an incandescent burner adjusted to the conditions which prevail in the consumers' houses, and found that the light was very good indeed. On reckoning up the make per ton, this totted up to—well, I think I had better not state it, but it was a record. What I surmise happened was this. The stoker kept the exhauster "pulling," thus introducing producer gas and also possibly water gas into the leaky retorts; and these mingling with the high-grade gas there produced resulted in this phenomenal make. Could I reproduce the same conditions, I would have no hesitation whatever in supplying such gas at all times; but, unfortunately, I can only regard it as one of those accidental liftings of the veil which conceals from our view the hidden mysteries of science.

Perhaps the most important and least understood piece of apparatus in our works is that "cabinet of mysteries" the hydraulic main. Yet there is no other portion of our plant which better repays close attention, begotten of a correct appreciation of the principles underlying the work required of it and the conditions which prevail therein during the various stages of working; and this quite apart from the ordinary mechanical operations of flushing-out the main frequently. In how many works is even this primary necessity recognized and carried into effect?

Possibly the inconvenient position in which the hydraulic main is placed, and the unpleasant conditions usually associated with the top of retort-benches, has something to say to the closer acquaintance that is so desirable not being formed; and it would be well, when extensions are being planned, that greater facilities for easy access and inspection are not neglected. This need not extend to the provision of those promenades, positively alluring in their luxurious proportions, observable in photographs of large retort-benches recently constructed. All that is required is to make the spending of a few hours on this too little frequented portion of our domain a trifle less purgatorial.

The foul main also is more deserving of being allocated a higher position in our estimation than merely being regarded as a connection between the hydraulic main and the condensers, as its stunted and attenuated appearance and primitive construction in some of our works would seem to imply. Properly constructed, the foul main is capable of performing most important functions in the earlier processes of purification; and, judiciously worked, it is capable of eliminating to a considerable extent those naphthalene worries which are the source of so much trouble and expense. This has been my experience where the gas is caused to travel slowly along with the hot tar and other liquids through a foul main 18 inches in diameter. It is important, however, to remove the liquids before their temperature falls below a certain degree. By doing so, we retain in the gas the lighter hydrocarbons which would otherwise have been absorbed by the tar.

Now, I am not writing an essay on gas-works management and construction, although you may have some grounds for thinking so. I cannot say anything here regarding the other processes in our works. I will merely remark that the use of an exhauster is now considered desirable even in the smallest works; and where this is the case I would recommend some type of mechanical washer. It is a matter for wonder to me that, in a country where natural oxide is so easily obtainable, more use is not made of it as a gas-purifying agent. Possibly the fact that our purifying boxes are too small, restricts its use; but I should say that the resulting economy would well repay the expense necessitated by putting in larger purifiers. It is necessary, of course, that the purifiers should not be called upon to eliminate impurities which should have been treated elsewhere; and it is well not to emulate the condition of one works I know of, where the solitary purifier was also the tar-extractor, liquor well, and exhauster (of patience) all combined. Amid such divided duties, legitimate purposes for which a purifier is intended are likely to suffer in the performance.

Little change has to be recorded in our distribution system or methods, if we exclude the sending out of our gas at higher pressures than formerly. Higher pressures are now desirable, and, indeed, necessary. Pressures of 3 inches or 4 inches are very ordinary; and I cannot trace that leakage is greater in consequence. The introduction of steel mains in our distributing systems is the only departure from the methods instituted more than half-a-century ago; and there can be no doubt that they possess qualities of such merit as will make them in many places to be preferred to cast iron. Considerable attention has been devoted to the method of jointing these mains; and the latest method—known as the "Anderson" joint—would appear to combine the best features of the rigid and flexible joint.

In bringing these remarks to a close, I must apologize for the somewhat tentative manner in which I have dealt with matters of importance, and the length of my remarks devoted to matters of smaller moment. I make no claim for any great originality of thought which would throw a new light on any branch of our profession. Many details, I have not touched on at all. But they have all at one time or other received due attention from others; and, indeed, anything I have said has been better said repeatedly by other holders of this office. Your President of two years ago, Mr. Airth, pointed out the importance of little things, which in the aggregate assume great significance; and it is to the small gas-works manager I have addressed my remarks, as befitting one whose work has been performed and experience gained in such works. It is because I know—none better—the great difficulties we are confronted with, situated as most of us are in a business sphere, with its horizon of such circumscribed limits, where we can never experience to the fullest extent the spirit-lifting effect which the successful accomplishment of things inspires, that I abjure you with all the insistence possible not to allow this to lessen your interest or despise the work of your own hands. It is well sometimes to take an impersonal view of our work; and we should cultivate the faculty of getting outside it, so to speak. We ought not to be specialists or only capable of thinking in five places of decimals. Let us not forget there is a dignity attaching to small things rightly considered. Make certain we do nothing to alter that, either by taking too low or too high a conception of our position. Do not be ashamed because of the size of your works. You cannot estimate a man's worth in millions of feet or by the number of lifts in his holder. You must be able to take off your coats and get right down to work, and yet resume your position as manager without losing your proper perspective.

There must inevitably be something in my remarks with which you cannot agree. It is, indeed, difficult to resist the temptation which immunity from criticism secures to the presidential address. My sincere desire, however, was to say something at least which would make for the solidarity of the gas industry in Ireland and the welfare and usefulness of the Irish Association.

OBITUARY.

The recent death is announced of Herr E. WINDECK, at the age of 57 years. He was in turn Manager of the gas-works at Bochum and Schalke in Westphalia; but in 1888 he started in practice as a Consulting Gas Engineer in Cologne, and was the representative in that city of the Berlin-Anhalt Engineering Company. He was a very active member of German technical (gas) institutions.

We regret to record the death on the 29th ult., at the early age of 35, of Mr. FRANK PARSONS, the Secretary and Manager of the Rowley Regis Gas Company. Deceased had been suffering for some time from an incurable disease, but was able to leave his house a few days before his death. Mr. Parsons was the son of the late Mr. J. H. Parsons, for many years Manager of the Oswestry Gas Company. After serving an apprenticeship to a firm of mechanical engineers, he was for two years with Mr. William North, at Stourbridge, as Assistant and Draughtsman; and prior to obtaining the appointment at Rowley Regis, he was Manager of the Cefn Gas-Works. He was highly respected by his Directors, by his brother Managers, and by all with whom he was associated. He held the Honours certificate for "Gas Manufacture," and a number of first-class certificates for science subjects obtained at South Kensington. He leaves a widow and two children.

As the result of a long illness, which, however, had only lately confined him to the house, Alderman THOMAS KING, J.P., a Director of the Portsmouth Water Company, died at his residence in the borough early last Tuesday morning, in his 67th year. Deceased was a member of a well-known firm of local auctioneers—Messrs. King and King—which he joined in 1863; and his capacity for business was largely instrumental in bringing the concern into its present prosperous condition. In 1884 he was elected a Director of the Portsmouth Water Company, and subsequently of the Water-Fittings Company. In 1886 he entered the Town Council, and was Chairman of the Watch and Sanitary Committee at the time of his death. In 1894 he was elected to the position of Chief Magistrate, and the following year was elevated to the Aldermanic Bench. During his Mayoralty, the Italian fleet visited Portsmouth; and in recognition of the welcome he gave them, he was the recipient of an Italian decoration. He was also made a Justice of the Peace for the borough. Deceased was regarded as one of the makers of modern Portsmouth; and he has left his mark upon it for all time. Referring to him last Tuesday, the Portsmouth "Evening News" said: "Enjoying the fullest confidence of his colleagues and the esteem of all his fellow-citizens, he has gone down to death truly and deeply mourned."

The "Water Arbitration Prize."

The Institution of Mechanical Engineers have received from the Metropolitan Water Board and Sir Edward Fry, the Chairman of the Court of Arbitration under the Metropolis Water Act, 1902, two sums of £250 each, which the donors desire to be used for some engineering purpose connected with the Institution. The Council have invested the amount (£500) in a trustee security, the income from which they have decided, after consultation with Sir Edward Fry, shall be offered biennially for some paper submitted in accordance with prescribed conditions. It has been further decided that the prize shall be known as the "Water Arbitration Prize," and shall be offered for a paper on an engineering subject to be announced by the Council one year before the time for sending in the papers. The prize, which will have a value of approximately £30, will take any form which the Council may from time to time decide upon, and will be accompanied by a certificate bearing the seal of the Institution. If, in the opinion of the Council, no paper of sufficient merit be received in reply to any particular offer of the prize, the amount available for the award will be added to the capital of the fund. The conditions for the first award, to be made in 1908, are: (1) The award will be made to the author of the selected paper dealing with the filtration and purification of water for public supply. (2) Members, associate members, associates, and graduates of the Institution may compete. (3) Papers must be sent in to the Secretary of the Institution of Mechanical Engineers, and must reach him not later than Jan. 3, 1908. (4) Each paper must be clearly written, or type-written, on one side only of foolscap paper, with a margin, and must be accompanied by an outline or synopsis of its contents of not more than 600 words. Illustrations submitted with the paper must be properly drawn to scale. (5) Papers submitted for competition will become the property of the Institution, and, at the discretion of the Council, may be either read and discussed at a general meeting or printed in the "Proceedings" without having been so read and discussed. Each paper must consist of original matter written by the competitor himself, and the Council will require a written statement to this effect. Any paper not accepted for printing in the "Proceedings" will be returned to the author. No paper which has been previously published will be accepted for competition.

Mr. John G. Holmes, of Belmont, Chester, J.P., a Director of the Chester Water Company, left £58,145.

THE CENTENARY OF GAS LIGHTING.

(*Continued from p.* 385.)

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In 1870, owing to the sudden illness of Mr. Esson (the eminent Gas Engineer previously mentioned), who was at this time President-Elect of the British Association of Gas Managers, Mr. Magnus Ohren was unexpectedly called upon to fill the office of President of the Association. In his Inaugural Address, he dealt chiefly with the question of sulphur compounds, and said:

> Gas can be made practically free from impurities; and it is but right that the consuming public should have pure gas to burn, especially now that chemical science has shown us the way to free our gas from these impurities which thirty years ago we supplied with the gas, because we had not then the knowledge required to grapple with those difficulties. About that time, with gas at 10s. per 1000 cubic feet, I remember perfectly well, when testing gas for sulphuretted hydrogen by means of acetate of lead—the only test for sulphur known to the gas engineers of that day—I often found the test of a shade which, if found in the gas of the present day, would make Dr. Letheby's hair stand on end with horror at the amount of impurity. Mind, I am giving you my experience of thirty years ago, when I was a pupil of the engineer of one of the London Gas Companies. Chemical science has, however, made vast strides since then; and the case is very different in the present day. Gas can now, and should be, served out to the public free from visible sulphuretted hydrogen and ammonia.

This statement was followed by two papers on "Purification," one by Mr. Upward, of the Chartered Gas Company, and one by Mr. George Livesey, of the South Metropolitan Gas Company, on "Scrubbers," who explained an admirable arrangement by means of thin boards placed edgeways tier above tier, which he had used at his works, and which he said was very effective, never got out of order, and never wanted changing. Mr. John Ohren, of the Rio de Janeiro Gas Company, substituted plates of iron for trays of coke, with good effect.

It was at this time that the first mention of the "Iron Stoker" was made, in a paper by Mr. Somerville, of Dublin, who gave his additional experience of Best and Holden's "Iron Stokers." Mr. Magnus Ohren said he had seen the one at Dublin at work; and he also called attention to the "Iron Stoker" produced by Messrs. Dunbar and Nicholson for drawing and charging single retorts. He mentioned, too, an "Iron Lamplighter." Mr. Price's apparatus was described, also two additional lamplighters—the hydraulic lamplighter and the pneumatic lamplighter, the first designed by Mr. Hunter.

The address also dealt with the endeavours made to lighten Sunday labour, by Mr. Morton, of the London Gas Company, and Mr. Livesey, who introduced the principle. To show that there is "nothing new under the sun," it may be pointed out that Mr. Ohren referred to a paper read before the Association on "Tar Pavements," by Mr. T. H. Methven, of Bury St. Edmunds. But the most interesting item in the address was the allusion to the introduction of gas-cookers; Mr. Somerville, of Dublin, having first brought them into use at Maidstone. So satisfied were the consumers with them, that they were taken faster than he could make them; and his summer consumption of gas was largely increased.

In 1872, Mr. C. Heisch, remarking on what was being done in the way of improved gas purification throughout the country, said: "Experience shows that a much lower maximum than 20 grains of sulphur is obtainable; and processes are being employed in some gas-works in the country which, if all we hear be true, enables gas of unprecedented purity to be supplied from works situated in densely populated places, without creating the least nuisance." He asked, "Why is the Metropolis not to have the benefit of these improvements?"

In 1876, the sliding-scale, the auction clauses, and a standard price were introduced into the Gaslight and Coke and South Metropolitan Companies' Acts. A standard price was fixed, and also a standard dividend of 10 per cent., which could be raised 5s. per cent. per annum for every 1d. taken off the price per 1000 cubic feet. This 10 per cent. dividend was to be reduced proportionately if the Companies increased the selling price above 3s. 9d. and 3s. 6d. respectively. Under the new conditions of parliamentary regulation and control, the companies were given an interest in reducing the price of gas by this two-way sliding-scale, which made the dividends depend on the prices charged to the consumers, and vary inversely with them. With such a system, high dividends would mean cheap gas; and the interests of the companies and the consumers would be absolutely identical.

London cannot claim to be the originator of the sliding-scale. It had already been put into the Sheffield Gas Company's Act in 1866, and in the West Ham Company's Act of 1869; and in 1874, at a meeting of the British Association of Gas Managers, Sir George Livesey warmly dealt with the question, and strongly advocated an up-and-down unlimited scale, giving an increase of dividend for every reduction of price below, and making a decrease for every rise of price above, a fixed limit. Thus, as far as London is concerned, Sir George Livesey may be termed the father of the gas companies' sliding-scale.

Sir George Livesey, in speaking of this at a later date, says of his introduction of the sliding-scale: "Strange to say, all the Companies, mine included, refused the sliding-scale in 1875. Except the Commercial, the whole of the Companies were against me. Lord Grimthorpe, then Sir Edmund Beckett, who was Counsel for the Companies, in one of these [Parliamentary Committee] rooms, referred to me as 'this traitor; this Queen's Evidence.' Twelve months later, they came for the sliding-scale. My own Board were divided; three were in favour, two against, and so they went with the rest. Then those Companies I mentioned came to Parliament and applied for the sliding-scale."

The object of the sliding-scale was to secure "due care and management" on the part of the companies, by giving them (as the letter of the Board of Trade to Mr. James Beal of the Metropolitan Municipal Association in 1874 stated) a strong interest to reduce their expenditure—the "strong interest" being the power to divide more than 10 per cent. According to Mr. H. E. Haward, of the London County Council, the "sliding-scale has enabled the three London Companies to divide ever-increasing dividends, over and above the 10 per cent. to which they were originally entitled. In no year since 1875 have the dividends fallen below 10 per cent. On the contrary, the dividends to which they have become entitled have most continuously risen. The South Metropolitan Company, with gas at 2s. 1d., are entitled to divide no less than 14¼ per cent.; the Commercial Company, with gas at 2s. 6d., can divide 13¾ per cent.; while the Gaslight and Coke Company, with gas at 3s., can divide 12½ per cent." "During the period from 1876 to the present," says Mr. Haward, "the three Companies together have distributed upwards of £3,000,000 extra in dividends in respect of capital on which they were formerly allowed only 10 per cent. This bonus may be safely said to be the price which the consumers have had to pay for any benefit which may have accrued to them under the sliding-scale." It should not be forgotten, however, that for the shareholders to get these dividends under the sliding-scale, the consumer would be securing cheap gas, out of proportion to the amount received by the shareholders, as will be seen from the following table (compiled by Mr. Haward) showing the Companies' and the consumers' shares in the increased profits under the sliding-scale at per £100, in 1876 and 1898:—

—	Companies.				Consumers.			
	1876.		1898.		1876.		1898.	
	Amount.	Proportion.	Amount.	Proportion.	Amount.	Proportion.	Amount.	Proportion.
	£	Per Cent.	£	Per Cent.	£	Per Cent.	£	Per Cent.
Gaslight and Coke Company	9511	17·7	14,806	14·5	44,088	83·3	87,406	85·5
South Metropolitan Company	3615	23·8	5,600	12·6	11,524	76·2	38,637	87·4
Commercial Company	1529	24·9	1,877	16·1	4,623	75·1	9,756	83·9

Thus in 1898, 85·5 per cent. went to the consumers and 14·5 per cent. only went to the Company on the north side of the river, and the same proportion practically on the south side; so that as consumption increases in a greater ratio than capital, so it will take more to reduce the price 1d., with a corresponding decrease in the amount to be received by the shareholders.

As to the auction clauses, the surrender of the privilege of allotting all new capital rateably at par among the existing shareholders was a concession, seeing that for many years the shares of the Companies were at a high premium, so that all new stock was issued below its actual value. The fortunate shareholder could then either keep his allotment, and continue to draw his 10 per cent., or dispose of it at the market price and reap an enormous profit. The shareholders were then, one can well understand, very loth to receive this new arrangement, which made all new capital go to auction. The old system meant that every penny raised by the Companies had to pay 10 per cent.; and though it was a very nice plan from a shareholder's point of view, yet the gas manager has come to see the arrangement from quite a different aspect—viz., capital charge.

There was still one Metropolitan Company without auction clauses in their Acts—the Commercial Company. These clauses were not inserted in this Company's Act of 1875. "Treated," says Mr. H. E. Jones, "with some favour by Mr. Forster's Committee in 1875, because they took the sliding-scale when the other Companies refused it that year, Mr. Forster in consideration did not impose the auction clauses upon them."

The standard price fixed for the three Metropolitan Companies at this date was: The Gaslight and Coke Company, 3s. 9d. per 1000 cubic feet; the Commercial Company, 3s. 9d.; and the South Metropolitan Company, 3s. 6d. There was no limit the Companies might not charge up to, providing they were willing

to sacrifice ¼ per cent. dividend. per 1d. charged; nor was there any limit downwards. The more they decrease the price, the greater is the amount they can share, until we see the South Metropolitan Company dividing 4 per cent. above their statutory amount, because they have reduced their price 1s. 4d. below the standard of 3s. 6d. In 1880, the selling price of the Gaslight and Coke Company was 3s. 4d., of the Commercial Company 3s. 3d., and of the South Metropolitan Company 3s.; and we find the South Metropolitan Company amalgamating with the Phœnix Company, whose selling price was 3s. 4d., and with the Surrey Consumers' Company, whose price was 3s. 9d.

Thus an end was brought to a long period of agitation, conflict, and trouble, extending over 28 years (from 1848 to 1876), during which period, arranged areas, fierce competition, authorized districting, amalgamations, and statutory monopoly had all taken part; and now, just when the Gas Companies were working in harmony, and competition and agitation had ceased, a fresh form of competition sprang up, in a new illuminant—electricity—which caused almost as much wonder as gas lighting in its early days. In 1880, the Jablochkoff Company (a French Syndicate) lighted up the Holborn Viaduct experimentally. It is interesting to note that a lamplighter was present each evening, from sunset to midnight, of the three months the experiment was running, to light up the gas-lamps when the electricity failed, and that his services were necessary. After three months' trial, it was found that the sixteen lamps cost £10 per night, against £1 7s. 1½d. for gas; or 10s. 7d. per lamp per hour, while the cost of a gas-lamp was but 0·27d., or little more than ¼d. Taking the charge per annum, electricity cost £3072 against £419 for gas, for this small area; and as the former light came to about 7½ times the cost of gas, the experiment was abandoned.

Electric lighting experiments went on in various parts of the Metropolis, and direful pictures of the downfall of the gas industry were drawn. In 1884, Sir W. H. Preece, the Engineer to the General Post Office, reported on experiments made with Edison and Brush lamps in London; and in 1885 Mr. Haywood made an interesting report as to the Municipality supplying electricity itself, in which he mentioned the complete stagnation in electrical enterprise in England attributable to the operation of the Electric Lighting Act, which "fettered the industry in a variety of ways." In the end, he was entirely against the Municipality supplying electric y itself, but he advised that it should encourage commercial enterprise. In 1883, Sir W. H. Preece, reporting on the electric light experiments, stated that though the streets of London were fairly lighted by gas, it had been proved, both by gas and electrical interests, that the illumination can be very materially improved; and his opinion was that, for street illumination, all the conditions could be obtained as well by gas as by electricity.

In spite of adverse criticism, experiments proceeded with this new form of lighting; and the Thames Embankment was lighted by Jablochkoff lamps. Later on, companies sprang up all over the country, and municipalities applied for Electric Lighting Orders, and commenced to light the streets with arc lamps at great cost. It was at this time, when gas companies throughout the kingdom were being "hard hit," that the wonderful invention of Dr. Auer Von Welsbach (who received the Institute gold medal), the incandescent gas mantle, was brought to the notice of the world; and although its price in this country (1s. 3d. each) and fragility, coupled with prejudice, and a certain amount of hesitation on the part of the gas companies, retarded its adoption for some time, it was found, on account of its cheapness by reducing the consumption of gas and giving three or four times the illuminating value, to be a very serious rival of the incandescent electric lamp for indoor purposes.

(To be continued.)

Mr. W. Harry Blakey, Assistant-Engineer to the York Gas Company, has been appointed Gas-Engineer to the Corporation of Morecambe, in succession to Mr. J. R. Duff, who has obtained the position of Manager and Assistant-Secretary of the Banbury Gas Company.

As usual on the occasion of the annual meeting of the British Association, the social side was by no means neglected this year. As our readers are aware, the meeting was held at Leicester; and the Local Secretaries were Mr. Alfred Colson, M.Inst.C.E., the Engineer of the Gas and Electricity Departments of the Corporation, and Mr. E. V. Hiley, the Town Clerk. The local Executive Committee, of which Mr. Colson was Chairman, have been heartily congratulated on the success of their efforts to secure the comfort and enjoyment of the members and visitors.

On behalf of a Commission appointed by the French Minister of Public Works, M. Le Gavrien has reported on the means adopted to prevent dust on roads. According to the Engineering Supplement to "The Times," M. Gavrien considers the various systems in use may be dealt with in four categories: (1) Tar spreading (employed hot or cold), (2) applying petroleum, (3) watering with various dissolved mixtures, (4) sundry processes which do not come under any of the above heads. While the first three divisions need little explanation, the author notices under the fourth head certain systems of forming roads which will not give rise to dust, such as the use of concrete or asphaltic mixtures. In his general conclusions, he speaks favourably of the use of tar, and he mentions as "palliative" processes the employment of petroleum and certain solutions analogous to Westrumite.

ENGINEERING QUESTIONS AT THE MEETING OF THE BRITISH ASSOCIATION.

At the recent meeting of the British Association in Leicester, various interesting subjects were brought forward in the Engineering Section, the President of which was Professor SILVANUS THOMPSON, F.R.S.

SCIENCE AND ENGINEERING—TRAINING OF ENGINEERS.

In the course of his Presidential Address, Professor Thompson referred to the development of engineering and its foundation on science. He said we lived in an age when the development of the material resources of civilization was progressing in a ratio without parallel. Everywhere we saw this ever-increasing development. We lived and worked in larger buildings, we travelled more, and every year there was springing up a greater demand for raw materials and products. We must not delude ourselves with imagining that the happiness and welfare of mankind depended only on its material advancement, or that moral, intellectual, and spiritual forces were not, in the ultimate resort, of greater moment. But if the inquiry were propounded what it was that had made possible this amazing material progress, there was but one answer, and that was science. Chemistry, physics, mechanics, mathematics—these had given to man the possibility of organizing this tremendous development; and the great profession which had been most potent in applying these branches of science to wield the energies of Nature, and direct them to the service of man, had been that of the engineer. Without him there would have been little of this activity; and without mathematics, mechanics, physics, and chemistry, where would have been the engineer? The difference to be found in the social and industrial conditions to-day and those of the pre-Victorian era were due not in any appreciable degree to changes in politics, philosophy, religion, or law, but to science and its applications.

Professor Thompson went on to say that in engineering, above all other branches of human effort, they were able to trace the close interaction between abstract science and its practical applications. People were assured that research in pure science was bound to work itself out in due time into technical applications of utility, and that the pioneer ought not to pause in his quest to work out potential industrial developments. Yet, admitting all this, it still remained true that in this thing the temperament of the discoverer counted for something. There was still another aspect of the relation between pure and applied science—viz., the reaction upon science and upon scientific discovery of the industrial applications; for while pure science bred useful inventions, it was none the less true that the industrial development of useful inventions fostered the progress of pure science. The history of electric telegraphy furnished a very striking example of this reflex influence; and in the history of the development of electric motive power they had a striking example of the interaction of science and industry. In 1857 electric motor power was thought impossible. Now, however, the electric motor was considered a gigantic success; and the reason for this astonishing revolution was the action and reaction of pure science. Pure science furnished a discovery; industrial applications forced its development; this development demanded further investigation, which in turn brought about new applications.

Turning to the subject of the education and training of engineers, Professor Thompson remarked that here, too, the interdependence of science and industry was recognized. Recent years had brought about a so much better understanding of education, that one seldom heard a practical man denouncing theory, or the theorist pooh-poohing practice. As a result, distinct progress was being made in the training of engineers. Knowledge perfected by study must be infused into the experience gained by practice, otherwise competition with systematically-trained workers of other nations was very unequal. The mental training most needed for the great majority of engineering students was that which would enable them to think in physics, in mechanics, and in geometric space, not in abstract symbols. One evidence of the wholesome change of opinion that was springing up concerning the training of engineers was the abandonment of the system of taking premium pupils into works with no other test or qualification than the money-bag. Premium pupilage was absolutely unknown in the engineering firms of the United States or on the Continent of Europe. The firms who had abandoned it were finding themselves better served by taking the ablest young men from the technical schools, and paying them small wages from the first, while they gained experience and proved themselves capable of good service. The premium pupil system had been weighed and found wanting, for two things clearly stood out—that the young engineer must be college-trained, and that when he went to work he should be regularly paid. If the institutions, schools, and colleges where engineering training was offered were but rightly developed and co-ordinated, the engineers of Great Britain need have no fear as to holding their own against the trained engineers of other countries. It was for the employers to make use of these institutions, and to show that sympathetic interest in their efficiency which was essential to their full success. A most important contribution to this question, which affected the whole future outlook of engineering generally, was the report of the Institution of Civil Engineers on the education and training of all classes of engineers. The

findings of the Committee of the Institution must, Professor Thompson thought, be received as the most authoritative pronouncement of the most competent judges.

THE PRESENT POSITION OF GAS AND PETROL ENGINES.

Mr. Dugald Clerk read a paper on "The Present Position of Gas and Petrol Engines." He said that at no previous time had gas and oil engine builders had so many orders in hand, and never before had these motors been applied so successfully to so many different purposes. The larger part of the gas-engine industry was occupied with motors of less than 100 H.P. per cylinder; and the turnover in Britain of such engines was at the rate of some 300 engines per week. It was generally recognized that these engines were as reliable as the best steam-engines of similar dimensions, and much more economical in fuel consumption. The smaller engines used coal gas; and the larger ones, producer gas generated in modern suction gas-producers using anthracite for fuel. Large gas-engines of English design had been built by the Premier Company, Messrs. Crossley Bros., Limited, and the National Gas-Engine Company. English designers had always felt the desirability of keeping down cylinder dimensions as much as possible; and Continental designers had recently shown a strong tendency to follow them. The large gas-engine really presented two distinct problems—the first to build engines of great power which would continue to run effectively and economically for long periods without breaking down; and the second to build them at a price sufficiently moderate to enable the engines to effectively compete with the large steam-engines in the matter of first cost. Personally, he did not believe that sound and continued commercial success could be looked for with really large gas-engines until some better solution had been found for their present constructive difficulties.

Apart from the questions of the engines themselves, Mr. Clerk said there were difficulties which prevented the equal competition of gas-engines with steam-engines for powers greater than (say) 400 or 500 H.P. Coal gas was too expensive a fuel for large engines. Producer gas effectively met the wants of medium-sized engines up to 200 H.P.; but the cost of anthracite handicapped engines of larger size, and equal competition would not be possible until better bituminous fuel producers were designed than those at present existing. The work on the Continent had not aided the solution of the bituminous fuel producer problem. Practically all the large Continental gas-engines were operated with blast-furnace gas. Some success had been attained in Britain as the result of strenuous and praiseworthy efforts by Dr. Mond, Messrs. Crossley, and others; but it could not yet be said that an entirely satisfactory bituminous producer had appeared. In his view, no such producer could be considered really satisfactory until it attained simplicity, lightness, and the fewness of parts of the anthracite suction producer which now formed so large a British industry.

The author went on to remark that the large gas-engine might be considered as combining the difficulties of hydraulic engineering work at considerable pressures with those proper to a boiler furnace or flue. Thick castings were required to stand the high pressures; but to allow free heat-flow from the flame within the cylinder to the water in the water-jacket called for thin castings. Though much ingenuity and skill had been spent in this direction, it was found that a dimension limit was very soon reached; and cylinders of 51 inches diameter were found to be too large. There were several ways of reducing temperatures and maximum pressures without reducing mean pressures; but all required much more accurate knowledge of the properties of the working fluid than was at present possessed. One solution of the problem appeared to lie in compounding; and he was now at work on this. Many attempts had been made to compound the gas-engine by Dr. Otto, Messrs. Crossley, Mr. Butler, Messrs. Dick, Kerr, and Co. and others; and he (the author) had also, at various times, built experimental compound engines. No success, however, had yet been attained. There was no difficulty in getting some work from the low-pressure cylinder; but the additional work obtained was always too small in amount to justify the expense of the separate cylinder. The lack of success was mainly due to ignorance of the rates of cooling of the working fluid at different temperatures and pressures; and as experiments made with closed vessels did not give much information on the necessary points, he made experiments of this nature on the engine itself in its working condition, instead of on closed vessels. At the beginning of 1905 he devised a new method, and performed a considerable number of experiments on a 50 H.P. gas-engine, by means of which he obtained a cooling curve in the actual engine cylinder and much other information of a useful nature, both from the scientific and the practical points of view.

Proceeding to give particulars of the experiments referred to, Mr. Clerk said the action of the engine was modified by so altering the valve arrangements that at any desired moment both inlet charge valve and exhaust valve could be held closed; and with this device he was enabled to get diagrams from which a cooling curve could be calculated. From this curve the apparent specific heat of the charge could be obtained by calculation. The mean apparent specific heat between 0° C. and 1000° C. was 15 per cent. greater than it was at 100°; and between 0° and 1500° it was 20 per cent. greater. These apparent specific heat numbers enabled a curve of heat-loss to the sides of the cylinder to be obtained either for complete double strokes or for partial double strokes at the inner end of the stroke. Where the engine was running cold, the mean temperature for the complete strokes of the walls was shown to be about 65°, notwithstanding that the jacket water was 13°. For the three-tenths stroke, running cold, wall temperature 165°. With the engine running hot, the whole stroke showed a mean temperature of the walls of 190°; for the inner three-tenths 400°. These differences were accentuated with greater metal thickness almost in proportion to the thickness. These numbers threw an important light upon the problem of the large gas-engine, and enabled him with some confidence to experiment upon the variations of indicator diagram and the transfer of hot gases from cylinder to cylinder required for successful compounding. In modifications of the conditions of the working fluid, combined with mechanical modifications of the engine using it, Mr. Clerk said he hoped to find in the near future some more satisfactory solution of the problem of the large gas-engine than at present exists. It appeared to him to be one more of working fluid than of pure mechanism. Progress in the direction indicated had been somewhat slow; but it had been steady. There was no occasion for discouragement. It was eminently unwise and unsafe to attempt to solve in too short a time the numerous problems involved. Gas-engine builders must be content with the slow growth of experience. Having alluded to the increasing interest shown in the application of large gas-engines to marine propulsion, Mr. Clerk called attention to the great success which has attended the use of the suction gas-producer, by which the power of gas-engines has been materially increased. Tests at the Royal Agricultural Society's show last year had, he said, proved that even small producer-driven engines only require 1 lb. of fuel per B.H.P. per hour, including lighting-up and stand-by losses of the producer at night. Other experiments (some by himself) proved clearly that with a good suction producer one could obtain 85 per cent. of the whole heat of the fuel in the form of inflammable gas ready for delivery to the engine. Many tests had shown that the running consumption of many of these engines at full loads does not exceed ¾ lb. of anthracite per brake-horse-power per hour. When referring to the petrol-engine, Mr. Clerk said this year the Royal Automobile Club had made a valuable set of experiments upon the exhaust gases given out by these engines under different conditions of running; and they clearly proved that, so far as visible smoke was concerned, many engines now on the road attained absolute perfection.

In conclusion, Mr. Clerk said that, so far as he understood the question, though large increases in thermal efficiency were still probable, efficiencies were quite high enough at present for all practical purposes; and the main efforts of engineers and scientific men interested in the internal combustion motor should be directed to the solution of the large gas-engine problem in such a way as to reduce the weight and increase the power of the unit; to improve the bituminous fuel producer; to apply the improved engine and producer to marine purposes, and overcome the various difficulties there presented; and in petrol-engines to design carburettors capable of proportioning the charge more accurately than at present under all conditions of running—whether with light or with heavy loads.

IMPROVED INCANDESCENT ELECTRIC LAMPS.

Mr. Leon Gaster gave a short description of the latest developments in the manufacture of incandescent electric lamps, and exhibited a number of new types shown for the first time in England. Owing to the high efficiency of these lamps, Mr. Gaster predicted that the expense for electric lighting will be greatly reduced in the near future, and that better illumination will be obtained. Some of the lamps shown used less than one-third of the energy required by the ordinary carbon incandescent lamps. He stated that the progress made this year had been remarkable. Many manufacturers on the Continent were ready to supply large quantities of these new metal filament lamps, and in England some firms were extending their works with the view of making the lamps here. Mr. Gaster pointed out the desirability for lamp makers to supply lamps combined with suitable shades and reflectors in one unit, so as to assist consumers in obtaining any desired effect of illumination. Particular attention was drawn to the necessity for manufacturers and large consumers of light to adopt proper methods of illumination; the advantages to be derived being manifold. First, the sight of the people would be improved and prolonged; secondly, the output would be quite appreciably increased; and thirdly—and this was very important—the quality of the work done under proper illumination would be of the same standard as when done in the daytime. The economies derived by not using proper methods of lighting were false ones when the fact was borne in mind that the expense of providing and keeping up proper illumination was in most cases only a small fraction compared with the value and the nature of the work turned out; and the author expressed the opinion that this question of defining the proper amount of light necessary for different purposes would form the work of the illuminating engineer as a new specialist.

REINFORCED CONCRETE CONSTRUCTION.

A paper on "Ferro-Concrete, with Examples of Construction," was read by Mr. J. S. E. de Vesian, M.Inst.C.E. The author referred briefly to the various kinds of materials that have been used for constructing buildings from early days, and showed that ferro-concrete is the most rational method, as in the Hennebique

system the disposition of concrete and steel allows of the maximum inherent strength of the two materials being made the utmost use of—that is to say, that the steel takes up all the strains due to tension, while the concrete bears those due to compression. In this manner 1 square inch of steel (say in the tension area of a beam) will interest 30 square inches of concrete on the compression side; and when one thinks of the different cost of concrete and steel, the economy is at once apparent. Not only is this method economical, but it is stated to be also extremely durable and fireproof. The importance of careful selection, of mixing, and treatment of the concrete was shown; and the specifications for this, as well as for the steel, were set forth. The author insisted on the test of reinforced concrete buildings, shortly after construction, with a load of 50 per cent. in excess of the calculated load. The behaviour of Hennebique ferro-concrete under stresses shows that this is really a new material, as its behaviour is so different from that of the concrete and steel separately. Perhaps one of the most marvellous uses of ferro-concrete is in the manufacture and use of piles. An important point which is often raised is the protection afforded to the steel by the concrete. The author mentioned this; giving as an instance the head of a pile which had been cut off and left on the foreshore, where it was uncovered and covered by the tide for more than nine years, and in which the steel showed as good as new $\frac{1}{4}$ inch under the skin of the concrete. This pile-head was brought up and broken in the presence of several eminent engineers the year before last. The impossibility of drawing up fixed rules for reinforced concrete constructions generally by corporations and municipalities was referred to. The chief safeguard to be employed is that of stringent tests after the construction is finished. In cases where much vibration is feared, from running machinery or other causes, ferro-concrete is said to be admirably adapted to minimize the trouble.

Mr. W. Noble Twelvetrees followed with a paper on "Some New Uses for Reinforced Concrete," in which he considered some types of construction that have not yet been applied in this country, others that have been adopted only recently, and others again that are not new in themselves, but are very suitable for employment in novel directions. In the first category may be placed such constructions as railway sleepers, standards for overhead electric cables in power transmission and electricity distribution systems, and poles for telegraph and telephone wires. The paper contained particulars relative to the design, construction, and application of such accessories as these, which are now coming into general use on the Continent and in America. In the second category was considered the employment of reinforced concrete in dock engineering, coast defence and harbour works, and long-span bridges for main-line railway traffic and crossing important rivers, as exemplified by typical structures in this and other countries. In the third category the author indicated the special advantages to be obtained by the adoption of reinforced concrete as a material for the construction of railway station roofs, locomotive depôts, and bridges over railway lines. To illustrate its adaptability to these new uses, he gave brief particulars of roofs that are akin to those generally built in steel for covering railway stations, of a locomotive depôt erected on the Jura-Simplon line, and of highway and foot bridges over railway lines. Finally, he alluded to the method successfully adopted on the Continent for preserving steel bridges by encasing them in concrete—a course that is commended to the attention of railway companies and highway authorities in places where the corrosive effect of locomotive fumes is a constant source of trouble and expense.

THE PRESENT ASPECT OF CHEMISTRY.

At the close of the extracts from the address of Professor Smithells to the Chemical Section of the British Association given in the "JOURNAL" last week, it was mentioned that the concluding portion of the address consisted of some observations on the progress of chemical science and the training of chemists. On these subjects he made the following remarks.

One of the penalties of devotion to a progressive science is the constant feeling of being left behind, and the knowledge that, while we are attending to our personal task, things are happening, near or far, that may, for all we know, be affecting the simplest facts and the most elementary principles on which we have been accustomed to rely. This is a feeling that may well prevail at the present day. At the same time, I do not think there is any occasion for panic; and I cannot help regretting the somewhat sensational language that has been used, even within our own circles, in regard to recent discoveries. The revelations attendant upon the investigation of radio-activity do indeed mark a distinct epoch in the history of chemical discovery; but that they entail anything like an unsettlement of our scientific articles of faith is not to be admitted for a moment. They make us realize in perhaps a not unprofitable way that scientific knowledge and scientific theories are necessarily proximate, never ultimate, and that ideas which may have been entertained for a long time without any modification, and so have begun to seem perpetual, are, after all, only provisional.

The perplexities of chemists at the present day do not come, I think, from the novelty of the ideas that are being presented to them, but from the great rapidity with which the whole science is growing, from the invasion of chemistry by mathematics, and, in particular, from the sudden appearance of the subject of radio-activity with its new methods, new instruments, and especially with its accompaniment of speculative philosophy. There is an uneasy feeling that developments of great importance to the chemist are being made by experiments on quantities of matter of almost inconceivable minuteness. Spectrum analysis, of course, took chemistry beyond the limits of the balance; but the new materials which it disclosed could at least be accumulated in palpable quantity. With radio-activity we seem, in relation to the ponderable, almost to be creating a chemistry of phantoms; and this reduction in the amount of experimental materials, associated as it is with an exuberance of mathematical speculation of the most bewildering kind concerning the nature, or perhaps I should say the want of nature, of matter, is calculated to perturb a stolid and earthy philosopher whose business has been hitherto confined to comparatively gross quantities of materials and to a restricted number of crude mechanical ideas.

I should, however, gravely abuse the position in which I am allowed to speak for the moment as a representative of chemists if I failed to express profound admiration for the masterly work which has been accomplished by the pioneers of the science of radio-activity. All that I wish to say beyond that is in explanation of a certain awe or trepidation which chemists of the older school may feel in the presence of such bold explorers; and I am the more tempted to say something on the subject, because in recent times, before the advent of radium, a good deal has happened which has given chemists occasion to ask themselves whether chemistry was not beginning, as it were, to drift away from them.

The most conspicuous development of the science during the past twenty years has been, of course, on the physical side; and abundant have been its fruits. But it has seemed to demand from chemists habits and endowments which they did not normally possess, and which they could not easily acquire. I was much struck by a remark made to me a few years ago by a distinguished chemist, who is, I think, the most perfect manipulator I have ever seen at work, to the effect that he felt himself submerged and perishing in the great tide of physical chemistry which was rolling up into our laboratories. Now, it is precisely such men that must be preserved to chemistry. Though chemistry and physics meet and blend, there is, I believe, an essential difference between the genius of the chemist and the genius of the physicist; and I venture to think that some insistence on the primary functions of a chemist is not untimely. The chemist's first qualification is that he shall be master of a peculiar craft; his greatest merit, that he is a consummate workman; his distinctive power, a nicety of discrimination in all questions affecting the composition and quantity of materials. He is not given to elaborate theories, and is usually averse to speculation; nor has he generally an aptitude for mathematics. Such the normal chemist is, or was, and such I hope he always may be.

There seems to be a solicitude in some quarters to make a chemist something more than a chemist—a solicitude which, if gratified, will, I believe, make him something less than one. We are told, for example, that a chemist should be a mathematician. I do not admit it for a moment. Some mathematics he must of necessity have—that has always been admitted. But in proportion as chemistry develops on the mathematical side does it become important, not that our chemists should be trained in mathematics, but that they should be more than ever carefully trained in the art of exact experiment; that their methods of work, their powers of observation, and, if possible, their experimental conscience, if I may use the expression, should acquire a finer edge. There is never more cause for anxiety than when we see a mathematical theory awaiting the delivery of the confirmatory facts; there is nothing more important for chemistry than the continual recruiting of that Old Guard which will be ever ready to stand to arms on the appearance of an eager theorist.

Chemistry is becoming bewildering in its extent; and it would be a great misfortune if this led to the notion that every chemist must try to enlarge his ambit to its confines, and to fit himself for every variety of work. Those of us who have responsibilities as teachers cannot, I think, be too careful, lest in the attempt to secure breadth we may encourage shallowness, and fail to give our students that peculiar and time-honoured discipline in exactitude of work in chemistry proper which has characterized the chemists of the past, and which is infinitely more important than superficial dealings with a great variety of processes and appliances. I confess that I have frequent misgivings as to whether our modern courses of instruction may not tend to turn out chemists more learned in the science and less perfect in the art than was the case under the ancient *régime*.

Another perturbation within the chemical camp in recent times has come from the region of philosophy. Even before the days of radium we have been accused of clinging too fondly to our atomic theory, and of stating our knowledge too exclusively in terms of that theory. We are said to have drifted into a dogmatism as real as any we ourselves have had to attack, and to shut our eyes to the light which will enable us to orient ourselves truly in the wide realm of thought. The answer that most of us would give would be, that we value our hypotheses according to their productiveness in new knowledge; and that it is, on the whole, perhaps better to over-exalt an hypothesis that is fertile than, from high considerations of philosophy, to allow our ideas

to become so fluid that they can afford no rigid framework for thought. I think that the attempts to view chemical phenomena apart from atomic hypothesis, interesting as they undoubtedly are, have not made us feel that this hypothesis has either misled us in any matter of fact or obscured any pathway that we might have followed with greater profit. The value of the thermodynamical treatment of chemical problems is attested by its fruitfulness in promoting fresh discoveries; and here we may welcome a valuable adjunct to the atomic hypothesis. But I do not think we are called upon to acclaim a new method of treating old questions, unless it promises some more tangible result than an alleged improvement of our intellectual morals.

Few, I think, will deny that the atomic theory stands to-day as an indispensable instrument for productive chemical work; it has neither had its day nor ceased to be. Physicists have never been quite satisfied with the hard, indivisible ball of specific substance and definite mass which has served chemistry so well. They have given it bells, have made a vortex ring of it, and have indeed done much that few chemists can understand to make it meet the exacting requirements of their science. But to us it has always been the same; what we have done to it has been external—we have given it, vaguely perhaps, a charge of electricity, a store of energy. We have attached the hooks or rods of valency; but we have not meddled with its interior. We are now called upon by chemical considerations of change of composition, as well as by other considerations more recondite, to subdivide our atom, to credit it with an unsuspected store of energy, to consider it a congeries of unsubstantial electrons. We should wish, of course, to know that the evidence is good enough; but otherwise there can be no possible objection from our side. It will undo nothing that has been done; and we may have good hopes that it will lead to the doing of many new things in chemistry. The newer theories are in consonance with the old in one most vital point—they afford those mental pictures of phenomena which most of us find indispensable for fruitful work. They do not belong to what Professor Schuster has characterized as "the evasive school of philosophy."

A NEW CONTINUOUS WATER-SOFTENER.

By Harold Baron, B.Sc.

It is a well-known fact that, in most operations in which water is employed, it is not possible to make use of it in the condition in which it naturally exists. Various substances in solution, which form scale in boilers and have a destroying effect upon soap, have first to be removed. In general, the purification takes place in two stages. First, the scale-forming constituents of the water are precipitated by means of chemical reagents, and the muddy liquor so obtained is mechanically clarified by means of special apparatus. Finally, the water is passed through some form of filter, and is then in a fit state to be pumped into the boilers, or used in many of the applications where pure water is a necessity.

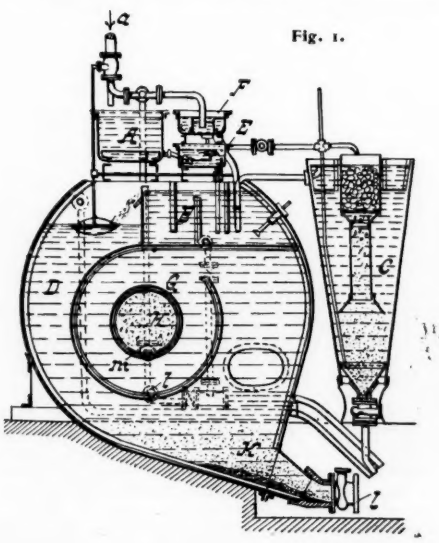
The chemical treatment of water to be softened is sufficiently well-known to need no detailed description here. It usually takes the form of precise additions of lime and soda, depending upon the dissolved constituents of the water as determined by chemical analysis. The bicarbonates of lime and magnesia, which form the "temporary hardness," and the sulphates and chlorides, which produce the "permanent" hardness, are precipitated as carbonates. The water is thus rendered turbid, and must be clarified and filtered before it can be used for industrial purposes. The clarification and filtration of the water are at least as important as the chemical treatment, and form an essential feature of all the water purification apparatus employed at the present day. The various forms of water-softeners on the market differ mainly in the construction of the settling tank; and it is well-known that in many softeners this part of the apparatus, in which the settling out of the mud is effected, is of complicated construction.

The insoluble matter precipitated in the chemical treatment can be divided, broadly, into three classes—matter which sinks after a comparatively short time, matter which remains in suspension, and matter which floats. The first of these can be removed by allowing it to settle out; while the two latter must be removed by filtration. The aim of the water-softening chemist is to keep the proportion of suspended matter as low as possible, in order to avoid as far as he can periodical spoiling of the filter. The clarification of water on a large scale is effected by allowing the mud to settle out in basins or tanks of suitable character. The usual forms of construction may be divided into three classes: (1) Settling in still water, (2) settling in a slowly ascending stream of water, and (3) settling in a descending and ascending stream of water. The method usually preferred is the third of these, in which the water moves first downwards and then upwards. The advantages of this plan consist in economy of space and increased capacity. Most of the water-softeners in general employment to-day make use of this principle.

In considering the construction of the settling-tanks in which the mud formed by the chemical treatment is to be separated, a number of important points must be observed. The distance through which the particles of mud in settling have to pass should be as short as possible; any sudden alteration in the direction of the stream of water flowing through the apparatus should be avoided; the speed of the water current in the vicinity of the deposited mud must obviously be as small as possible (otherwise the sediment is liable to be stirred up again); and, further, the path through which the current of water is led should be as long as practicable, so that as much as possible of the suspended matter can settle out before the current of water reaches the filter. A number of practical requirements should be added to the theoretical considerations enumerated above. The softener should not be too complicated; otherwise the cost of construction will place it beyond the reach of the majority of steam users and those to whom softened water is a desirable, but not a necessary, raw material. Then, too, the space taken up by the apparatus must not be too great, since the available space in many existing boiler-houses leaves only sufficient room for a water-softener of modest dimensions. Moreover, the apparatus should work as far as possible automatically, so that its attendance may not form too large an item in the working expenses.

The "Rottmann" continuous water-softener, which has lately been introduced by Messrs. J. A. Miller and Co., of Berlin, would appear to approach somewhat closely the theoretical and practical requirements necessitated in modern water-softening practice. Figs. 1 and 2 show the apparatus in vertical section. The crude water enters in the direction of the arrow at *a*, and passes out into the distributor F. Part of the water then flows into the heating and mixing tank B; while a further portion passes by the special pipe into the apparatus C, where the lime water is automatically produced. The tanks A and E serve for the preparation and introduction of the soda solution. In the mixing-tank B, the water is heated up with fresh or spent steam, and mixed with the chemicals, lime and soda, introduced under automatic control from the tanks E and C. Treated in this way, and now containing much insoluble matter, the water pours over into the settling-tank D, in which the process of mechanical clarification takes place. The current of water flows slowly down the narrow section of the apparatus, and the suspended matter gradually settles out and locates in the basin K. From time to time the mud which has located here may be washed out through the outlet *l*. The settling-tank is so constructed that the turning

Fig. 1.



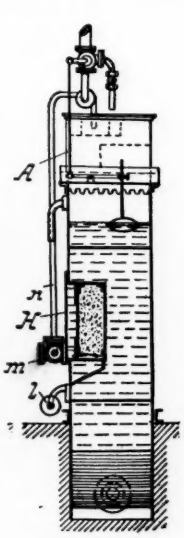
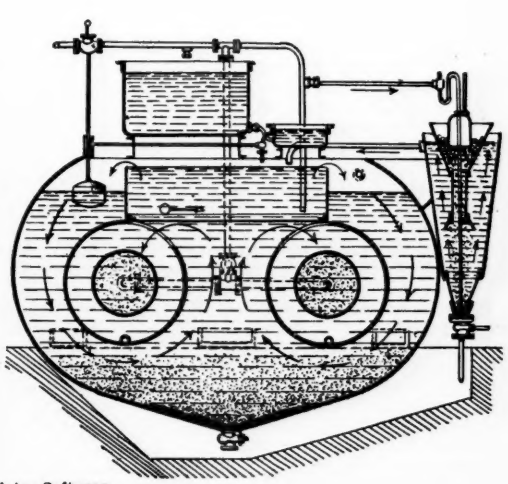


Fig. 2.



The "Rottmann" Continuous Water Softener.

of the current from the downward to the upward direction only takes place very gradually; so that the water remains a long time above the mud bay, and every facility is allowed for the particles of insoluble matter to settle out. Since the section of the apparatus is much narrower in the part where the current of water flows downward, the velocity of the current is here greater than in the portion of the apparatus where the current flows upwards. The velocity of the water in the downward direction gradually increases up to a certain point, and then in the upward direction gradually increases. The object of this is to accelerate the precipitating matter in the downward movement towards the basin K, while in the upward movement the velocity of the current is so small that the finer suspended particles, which take a longer time to settle out, are given every opportunity to fall out of the current.

From the outer settling-tank, the water now passes into the filter-chamber G. Here there is another mud outlet *l*, so that any matter which may locate at the bottom can be removed. Finally the water passes through the filter H, and can now be taken away for consumption at *m* in a perfectly clarified condition. The filter is built into the apparatus in such a way that the surface on which the current of water impinges is vertically situated. On this account, there is little tendency for the mud to settle on the surface. The filter, which may be conveniently made from sand and gravel in a filter-box, is arranged so that it can be easily taken out of the apparatus from the side. This, however, need only occur when it is necessary to provide the filter-box with a new filling. In most cases, it can be cleaned out by reversing the direction of the flow of water through the softener by means of a three-way cock, which is specially provided for this purpose in the pipe *n*. For very large softeners, special apparatus is provided, by means of which the sand in the filter-box may be stirred up, and in this way cleaned. As filter material, gravel, sand, coke, and wood pulp may be used. The filter surface should be of such an area that the speed of the water passing through does not exceed 15 to 30 feet per hour. A convenient width of the filter, which, of course, depends upon the character of the water dealt with, is 8 to 12 inches.

In fig. 2, a modification of the apparatus is shown, which is especially designed for dealing with large quantities of water up to 10,000 gallons per hour. The principle of the apparatus is identical with that of the one previously described, and differs only in being provided with two filter-chambers. The water, after being treated with lime and soda, and heated with steam in the central reservoir, falls over at both sides into the concentrical settling-tank. The currents of water increase in speed as they pass downwards at both sides, and then meet one another in the middle of the apparatus above the mud-collecting basin. Above the mud-collecting place, as will be readily observed from the illustration, the current of water is slow, on account of the increased width of the channel at this point. The water then divides and passes into the two filter-chambers, from which it is taken away in a purified condition.

A water-softener of the type shown in fig. 1 has been for some months at work in the boiler-house of the Luxemburg Prison authorities. Its operation has been satisfactory in every respect, as a water of 16 degrees of hardness has been reduced to 3 degrees, and this state of efficiency maintained. The attendance required by the apparatus is very slight, since the chemicals and water supply are automatically controlled, and the whole operation of softening is a continuous one. There can be no doubt that the "Rottmann" continuous water-softener will be much heard of in the early future.

Prize Winners in the Examinations in "Gas Manufacture."

We have received from Sir Philip Magnus, M.P., the Superintendent of the Department of Technology of the City and Guilds of London Institute, the names of the prize winners at the last examinations in "Gas Manufacture." They are as follows: Honours grade, first prize (£2 and a silver medal), Archibald Edgar Williams; second prize (£2 and a bronze medal), Clarence Harris. Ordinary grade, first prize (£1 and a silver medal), Frank Eliot Williams; second prize (£1 and a bronze medal), James Robert Bradshaw; third prize (a bronze medal), Thomas Walter Saville and Arthur Robert Wyatt (equal). The money prizes, as our readers are aware, are given by the Salters' Company. The winners of the first prizes are brothers—one being in the service of the Commercial Gas Company, and the other in that of the Imperial Continental Gas Association. They were students at the Regent Street Polytechnic, under Mr. Walter Grafton, where, as will be seen by the following list, they both obtained first prizes in the examinations conducted at that institution in April. Moreover, Mr. A. E. Williams was among last year's prize winners—being first in the Ordinary grade at the City and Guilds, and second in the same grade at the Polytechnic examinations. The following is the Polytechnic list: Honours grade, first prize (Polytechnic silver medal and a certificate), Archibald E. Williams; second prize (10s. and a certificate), Joseph Fisher; third prize (5s. and a certificate), P. Gwynn Jenkins. Ordinary grade, first prize (Polytechnic bronze medal and a certificate), Frank Eliot Williams; second prize (10s. and a certificate), W. F. Brown; third prize (5s. and a certificate), George Winslow. Certificates in the Honours grade were obtained by R. Lennox Fenner, Francis Higgins, and A. Harcourt Meade; and in the Ordinary grade by W. Beard and E. J. Luff.

REGISTER OF PATENTS.

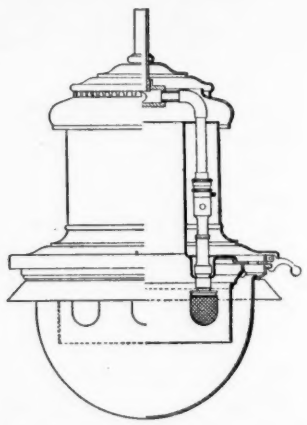
Incandescent Gas-Lamps.

DEUTSCHE GASGLÜHLICHT AKTIENGESELLSCHAFT (AUERGESELLSCHAFT) of Berlin.

No. 12,623; May 30, 1906. Date claimed under International Convention, June 7, 1905.

In incandescent gas-lamps in which the mixing-tube with the mixing-devices are arranged in the passages through which the combustion gases pass away, the patentees point out that the known defect exists that, in addition to a prejudicial heating of the whole of the lamp casing, the mixture of gas and air is excessively heated in the mixing-tube; so that, in consequence of its increased buoyancy or tendency to ascend, there is produced "an increased resistance to the movement of the mixture of gas and air." Owing to the weakening of the action of the jet of gas thereby entailed, the suction of air is diminished likewise; so that a bunsen flame which is partially luminous is produced, the "unpleasant noise" is increased, and the incandescent body becomes blackened. This defect arises principally when the gas pressure is comparatively low, or if it falls while the lamp is burning. For the purpose of obviating these defects, provision has at times been made for arranging the mixing-tube and the mixing-device in a special chamber separated from the waste gases; the air being drawn into the chamber while the combustion gases themselves pass out of the lamp through a chimney.

The present invention relates to an inverted incandescent gas-lamp of this kind; and the invention mainly relates to the particular formation of a closed air container constructed in such a manner as to surround the chimney or chimneys through which the combustion gases are conducted wholly or partially through the incandescent bodies, and which at the same time receives the mixing-device and the mixing-passage. The arrangement may also be such that only the burner-heads and the incandescing bodies extend through the bottom of the air-reservoir into the combustion chamber of the lamp. By means of the combination in accordance with this invention, the following advantages are (it is said) obtained among others.



A German Form of Inverted Gas-Lamp.

The mixing-tubes, with the mixing-device, which lie outside and around the discharge passage or chimney, are (as shown) readily accessible for the purpose of cleaning and placing in position, and are protected from the direct action of the combustion gases and from injury by the same. Effective transmission of heat to the mixing air in the air-reservoir (which does not, however, exceed the permissible amount) is produced, so that by the preliminary heating of the air for the mixture an increased luminous effect is obtained; while, on the other hand, the lamp will not fail owing to low or falling pressure in the gas-supply pipe. The outer parts of the lamp are not excessively heated; and, owing to the diminished transmission of heat to the outer casing of the lamp, the result is attained that the parts are less liable to crack. The supply of air to the mixing air-reservoir may be regulated and adjusted by properly dimensioning the admission openings. Further, the chimney may be given as large a cross section as desired.

Another essential point is that the flue or chimney for the combustion gases may be of such a size relatively to the openings of the air-reservoir conducting the air into the combustion chamber, that a reduced pressure exists in the combustion chamber. In this way, a suction-effect is exerted on the interior of the mixing-tube in the air-reservoir; the air suction of the bunsen burner is largely increased; and its efficient action is not so dependent as before upon the suction-effect of the jet of gas—that is to say, upon the gas pressure. The desired end may advantageously be attained by arranging the upper opening of the discharge passage or chimney higher than the air admission openings of the combustion chamber.

It is advisable that the air-reservoir receiving the mixing-tube should communicate with the outer air only at its lower part. The result of this is that when the air-reservoir is carried sufficiently high, the air (owing to the heating) ascends by virtue of its natural buoyancy, and becomes dammed up in the air-reservoir—producing a certain excess pressure. This excess pressure propagates itself through the air-openings of the mixing-tube, and thereby assists the action of the bunsen burner. Further, the advantage is obtained that, owing to the diminution of the specific weight of the air, the injector action of the bunsen burner is rendered increasingly favourable, as the specific weight of the air approaches that of the gas.

Inverted Burners for Incandescent Lighting.

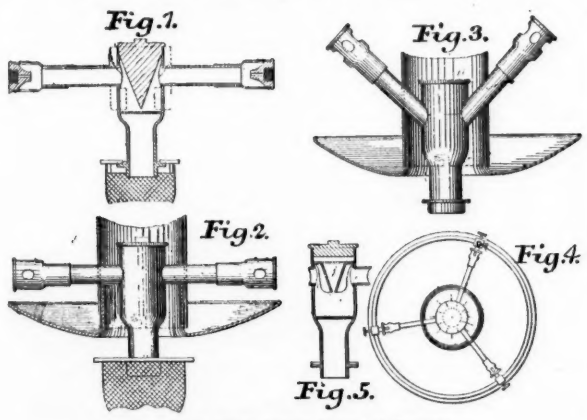
FRANCIS, A. S., of Farringdon Road, E.C.

No. 15,337; July 5, 1906.

This invention comprises improvements in, and connected with, inverted atmospheric gas-burners for incandescent lighting, concerning which the patentee says: As at present constructed, they have not been satisfactory or economical when they have been required to give off a light of more than (say) 100-candle power, or to consume more than (say) 6 or 7 cubic feet of gas per hour; and "attempts to produce burners to consume larger quantities of gas with a corresponding increase of light emission have not so far been successful." The chief reasons of non-success in attempts to produce a large inverted burner have been: The difficulty of arranging a gas injector to draw in sufficient air to the bunsen tube for perfect combustion and to maintain a sufficient velocity of the mixture through the tube; the difficulty of obtaining a perfect admixture of the air and gas; and the reduction in velocity of the mixture owing to its expansion, due to heating by the products of combustion. As a result, insufficient air was drawn in, the velocity of the mixture was low, the temperature of the flame was reduced, and lighting-back was rendered possible. Thus there was an unsteady and poor light, soot was deposited on the burner and mantle, and an unpleasant smell ensued. Clusters of lights have sometimes been used in place of one large light; but in a cluster, opposed portions of the mantles absorb the light from one another, and are therefore to a certain extent less efficient. Such a cluster was proposed in patent No. 8734 of 1905; and the present invention may be said to be a development of the arrangement there described. In one arrangement heretofore proposed, the inverted burner was made Y shape; the upper inclined members (of which there were two or more) being short compared with the length of the stem of the Y, and the gas being introduced by jets situated at some distance from the openings of such inclined members and delivering gas under pressure.

The principal object of the present invention is "to construct a burner which will efficiently heat an inverted mantle when burning large quantities of gas—say, from 6 cubic feet per hour and upwards." The invention also provides for preventing the air supply to such a burner from being vitiated by the products of combustion.

The simplest form of burner proposed comprises two or more bunsen tubes of any convenient construction having their delivery ends or points connected with a common mixing-chamber from which depends the burner proper. The burner may be vertical, and the plurality of bunsen tubes for supplying them with mixture may radiate from them—say horizontally and symmetrically, or as found convenient. The burner proper is preferably of smaller diameter than the common mixing-chamber, but of greater capacity than all the bunsen tubes. The air and gas inlets of each bunsen tube may be fitted with suitable regulating devices. The common mixing-chamber may be fitted interiorly with deflecting devices (one opposite each bunsen tube) for the purpose of diverting the flow from the bunsen tubes downwards into the vertical chamber and burner without appreciable loss of velocity. A single deflector common to all of the bunsen tubes, such as an inverted cone or frustrum thereof, may be used if preferred. Beneath the cone, and conveniently near the bottom of the chamber, a wire gauze or other screen may be situated to cause further admixture of the air and gas, as well as to prevent lighting-back of the flame. Care must be taken, however, that the mixing-chamber and burner shall be of sufficient diameter to take the heated mixture which has expanded, and that the screen shall be of such a character, and so situated, as not to appreciably obstruct the flow of the mixture.



Francis's High-Power Inverted Burner.

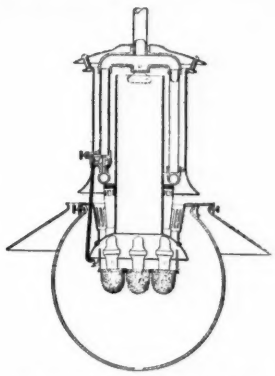
Fig. 1 is a vertical section through one form of burner constructed according to this invention. Fig. 2 is a sectional elevation showing a burner fitted with a reflector and chimney. Fig. 3 is a part vertical section and part elevation of a modification. Fig. 4 is a plan of a burner having a ring supply pipe connected to it. Fig. 5 is a central vertical section of a modified form of burner having the bunsen tubes broken away.

Gas-Lamps.

HUMPHREY, A. H., of New York.

No. 17,836; Aug. 8, 1906. Date claimed under International Convention, Nov. 16, 1905.

This invention relates to inverted gas-lamps of the kind in which each separate burner is fed by a burner-tube; and the burner-tubes are connected to a ring pipe arranged outside the chimney, to which gas passes by means of branch pipes from the supply pipe. Hitherto bent burner-tubes have been arranged so as to pass from the gas-ring pipe arranged outside the chimney, through the flared chimney or flue, and then down the chimney to the separate burners. By the present invention, however, each separate burner is fed by a burner-tube which passes downwards outside the chimney and through the outwardly projecting flange on the chimney to the burner, "so as to feed the gas to the burners at a much lower temperature than would be the case if the burner-tubes passed down the chimney, and so prevent the liability of back lighting." The general construction of the lamp is improved by supporting the globe and shade on the flange of the chimney (as shown) instead of on the outer casing.



Humphrey's Inverted Gas-Lamp.

In operation, the heated air and gases from the burners pass up through the chimney and out under the shield above it. The burner and gas delivery pipes are protected from these heated gases so that they do not become unduly heated, and cause back-lighting.

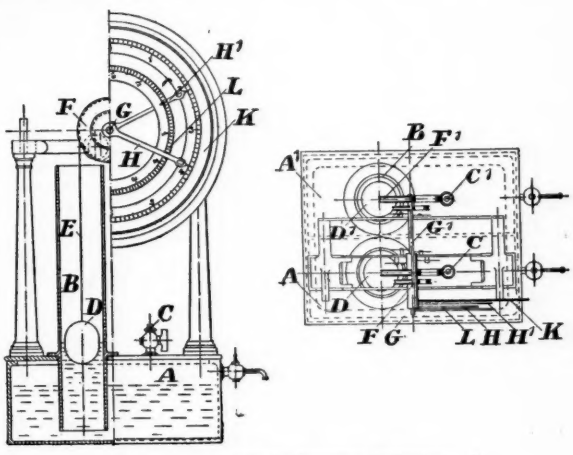
The burners are fully protected from draught, so that the flame is directed to heat the entire mantle; and at the same time the desired supply of air is insured, owing to the draught which is set up through the chimney. The burners, being grouped about the chimney, are in such a position that the fresh air is drawn up through the mantles—thereby "insuring perfect combustion of the gases."

Indicating the Pressure of Gas, Air, &c.

THOMAS, W., of Vancouver, B.C., and MILNE, J., of Edinburgh.

No. 21,300; Sept. 26, 1906.

The apparatus claimed by the patentees is of the kind known as a King's pressure gauge—consisting of an enclosed vessel containing within it a chamber extending down to near the bottom of the vessel communicating with the first vessel at the bottom, and open to the atmosphere at the top.



Thomas and Milne's Pressure Indicator.

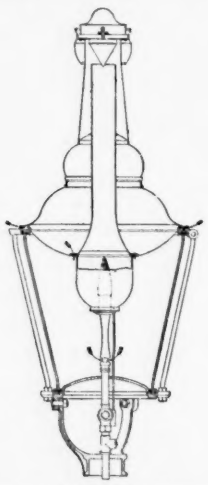
As shown, the vessel A is partly filled with water and the pressure of the gas is brought to it at C, so that it can press upon the surface of the water and force it up the chamber B (which is open to the atmosphere) to a greater or less extent according to the pressure of gas. A float D is provided in the chamber B which rises and falls with the water; and to it is attached a cord E, which passes over a pulley F, upon the axle G of which is fixed a pointer H to indicate the pressure. The apparatus consists of two such gauges, set together or made up in one case. The one gauge is connected at C to the gas as it enters the apparatus; the other gauge is connected at C^1 to the gas as it leaves—thus the two gauges show the inlet and outlet pressures respectively. One gauge is placed immediately behind the other, so that the axes of the pointers are identical; the axle of the rear gauge G^1 being solid, while that of the front gauge G is tubular. Thus both pointers H and H^1 can be fixed in front of the dial K, and indicate both pressures on it. To obviate the necessity of deducting the pressure of the inlet from that of the outlet when it is desired to obtain the pressure taken up by the apparatus, there is fastened to the pointer H^1 a ring or disc L divided and arranged to revolve with the pointer H^1, to which it is fixed. The other pointer H then indicates the difference of pressure between the inlet and outlet.

Street and Other Gas-Lamps.

WALKER, A. B., and DONALDSON, J. H., of Wallsend.

No. 22,131; Oct. 6, 1906.

This invention has special reference to intensified incandescent gas-lamps, and has for its object "to generally improve the construction and arrangement of such lamps so as to render them more efficient in use."



Walker and Donaldson's Street-Lamp.

The dome or bonnet of the lantern is made (as shown) with a detachable chimney, and there is a loose or separate intensifying tube fitted over and resting upon the globe—being provided with a packing ring, as usual, to make an air-tight joint. To obtain access to the burner or the interior of the lantern, the chimney and the loose intensifying tube are removed, when the dome or bonnet can be opened and turned back on its hinge as usual. When it is only desired to fit a new mantle to the burner, sufficient access can be obtained by merely removing the detachable chimney and the loose intensifying tube. It is only necessary to open the dome or bonnet when access is required to the whole interior of the lamp, as for cleaning and similar purposes. If desired, the detachable chimney may be provided with a guide or guides for maintaining the loose intensifying tube in correct position. By these means it is possible to dispense with the adjustable gallery and the hinged door at the bottom of the lantern; and as the globe is not clamped between the gallery and the intensifying tube but only supports the latter (which is not of great weight), there is less likelihood of the globe fracturing under heat and expansion.

Instead of fixing the reflector to the dome and admitting the air for combustion, which enters between the dome or bonnet and the top ring of the lantern frame below the reflector (as customary), a loose reflector is made to rest on a ledge on the top ring of the frame, so that the air enters the dome above the reflector and is heated by the intensifying tube. It then passes into the lantern and to the admission holes of the burner.

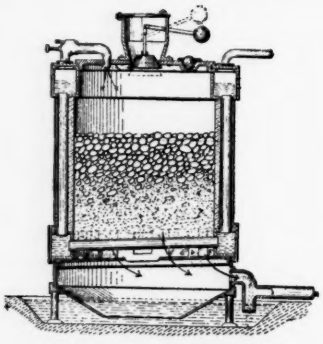
To reduce the shadow cast vertically below the lantern, it is provided with a transparent spherical or dome-shaped base, preferably formed in one piece, with suitable apertures for the passage of the gas supply and bye-pass pipes. In the supply pipe and outside of the lantern is a "blow through" branch or connection, normally closed by a cap or plug, so that the pipe and burner may be cleaned without removing the latter.

Gas-Producers.

ARMSTRONG, C. L., of St. Louis, Missouri, U.S.A.

No. 24,666; Nov. 3, 1906.

This invention relates to down-draught gas-producers in which the producer generates its own steam, which, after being mixed with air, is led to the top of, and through, the fuel in the grate. The object of the invention is to construct a producer in which a mixture of preferably saturated steam and air is forced downward (at stated intervals) through the fuel charge; the downward current being in a measure supplemented by the suction on the bottom of the fuel, resulting from the abstraction of the producer gas by the engine to which it is supplied.



Armstrong's Gas-Producer.

A special feature of the device shown is a pressure in the upper part of the generator produced by the introduction of steam mixed with air in suitable proportion. One effect of this pressure is to produce a downward current or flow of the intermixed steam and air, and thus facilitate the expulsion of gas through and from the lower portion of the generator. A more important effect is to condense the material designed for conversion into gas (especially when of light texture or character, like peat, lignite, coal slack, &c.) and maintain continuity and homogeneity in the bed within which partial combustion and the accompanying gasification take place. A still more important effect is to promote the union of the carbon and oxygen molecules by condensation, and thus increase the formation of carbon monoxide and keep the carbon dioxide down to a minimum. Incidentally, the pressure tends also to raise the temperature of the intermixed air and water vapour, thereby facilitating combustion and reducing the ratio of fuel consumed to that converted into gas. The downward passage of the gas and steam and air mixture through the mass of incandescent carbon further results in a complete elimination from the charge of all tar products; their disappearance resulting from the destructive distillation and incomplete combustion to which they are subjected in their passage—the products of distillation combining with the gases of the solid portions of the charge and conjointly escaping from the bottom of the producer. Another object is to construct a producer which shall serve as a furnace for its own boiler—the latter being provided with a water-tube grate for the direct support of the fuel; while a further object is to produce a gas which will not require a tar extractor or scrubber, and from which all solid particles and impurities are eliminated as it leaves the producer—such impurities being deposited in a water seal, which at the same time receives the ashes.

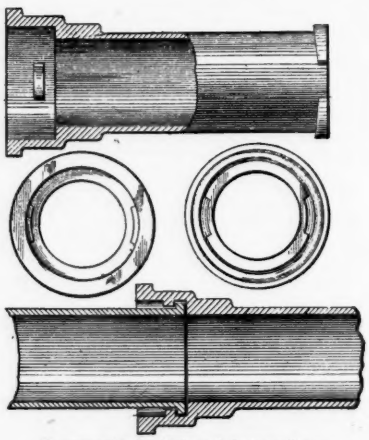
Socket and Spigot Pipes.

KEYWOOD, H. G., of Hoyland Nether, near Barnsley.

No. 25,343; Nov. 10, 1906.

Pipes constructed according to this invention have at the spigot end two or more concentric parts, bands, or bolts in the form of a flange having blanks, recesses, or spaces in them. Within the socket end of each pipe are projections or keys corresponding to the blanks or recesses on the spigot, and in such relative position that, when the spigot is placed with its blanks opposite the keys or projections within the socket of an adjoining pipe and pushed into the socket and then partially turned, the projecting portions or part flanges of the spigot pass behind the projections or keys in the socket, and the bores of the pipes are necessarily continuous and form a true invert by reason of the part bands or belts on the spigot ends of the pipes being in thickness equal to the interior diameter of the socket end of the adjoining pipe. The pipes are thus in correct relative position for being permanently jointed by lead, clay, cement, or other caulking or stopping according to the purpose for which they are to be employed.

In the case of cast-metal pipes, the projections or part flanges of the spigot end and the keys in the socket will preferably be cast thereto and form part of such pipes; but in the case of fire-clay or earthenware pipes, the projections or part flanges and keys may be moulded thereon or separately prepared and affixed thereto before or after firing or burning, and by the usual means of jointing parts of plastic wares, or by bitumen.



Keywood's Socket and Spigot Pipes.

The illustrations show an elevation partly in section of a pipe made according to this invention; an end elevation of the socket end of the pipe; an end elevation of the spigot end; a longitudinal section showing the spigot and socket ends of two pipes in position and ready for being permanently jointed.

APPLICATIONS FOR LETTERS PATENT.

17,267.—POWNALL, T., "Gas-producer." July 29.
17,319.—HALL, E. A., "Three-way cocks." July 29.
17,329.—HALL, E. A., "Air and gas mixing apparatus." July 29.
17,350.—EDGAR, W., "Plug taps." July 29.
17,376.—GOVAN, A. A., "Manufacture of sulphate of ammonia." July 30.
17,386.—SHAW, C. J., and WILLETTS, G., "Convertible arms for gas-fittings." July 30.
17,395.—COLE, R. & F., "Tap." July 30.
17,401.—FOWLER, W., "Gas-economizer." July 30.
17,438.—BOTLEY, C. F., and CUTLER, S., JUN., "Gas-generators." July 30.
17,442.—TURNER, F., "Inverted burners." July 30.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Capital Expenditure of Gas Companies and Local Authorities.

SIR,—It will, I fear, be thought that already too many figures have been cited in this controversy over what is in reality a very plain case. Your attitude with regard to it is the more remarkable because it has been apparent for years that the local authorities are reducing their capital indebtedness per million cubic feet much more rapidly than are the companies. But you want more figures; and, not content with renewing your charges against me of unfairness, attribute to me in addition a want of "alacrity" in, and a desire to "escape" from, complying with your behest. Need I say that had there been any reason to suppose that fresh light would have been thrown on the subject by the comparison you suggest, or that it could lead to a conclusion different from that which is afforded by the returns in their entirety, I should have made it long ago. However, it has now been made, and the particulars are given below. Four or five of the local authority undertakings—amongst them those of Birmingham and Glasgow—have had to be excluded, owing to a difficulty in finding for them suitable partners; and I have been obliged to include one of your prohibited companies—the Commercial—which, by-the-bye, is anything but "unique" as regards size. This inclusion was only to be avoided by a further omission from the other side.

Gas Sold.

	Million Cubic Feet.		Increase.	
	1882.	1905.	Million Cubic Feet.	Per Cent.
143 Companies	15,942 ..	37,738 ..	21,796 ..	136
143 Local Authorities . . .	15,458 ..	35,957 ..	20,499 ..	132

Capital Indebtedness.

	1882.	1905.	Increase. Total.	Per Million Cub. Ft. Sold.
143 Companies .	£11,073,414 ..	£22,443,990* ..	£11,430,576 ..	£525
143 Local Authorities.	11,188,683 ..	15,524,463 ..	4,335,780 ..	212

* After deduction of amounts added by conversion of stock.

The difference in favour of local authorities is seen to be £313 per million cubic feet; whereas in my previous comparison it was £311.

15, *Victoria Street, S.W., Aug.* 3, 1907. CHAS. HUNT.

[It may be claimed that a point has at length been gained, by the pressure applied, in getting Mr. Hunt to expand his figures. But really we do wish that someone would tell us how it is possible to make clear to Mr. Hunt (seeing that we appear to have failed so far, though using the plainest of language) that our quarrel is not with his figures, but with his insufficient explanation to inexpert people as to the causes which tend to widen the difference in the capital expenditure of gas companies per million cubic feet as compared with local authorities. We must insist on this point being kept in the foreground, as that was the gravamen of our reference to the matter in the leading article on the Hull Purchase Bill in the "JOURNAL" for July 9; and we emphasized it in the editorial notes to the letters from Mr. Hunt in the issues for July 16, 23, and 30. Our correspondent, inexplicably, has made no recognition of the point, but again says: "Your attitude with regard to it [not our complaint, but Mr. Hunt's point] is the more remarkable because it has been apparent for years that the local authorities are reducing their capital indebtedness per million cubic feet much more rapidly than are the companies." Can Mr. Hunt point to any statement in the "JOURNAL" on or since July 9 where this has been denied? We think not. He then says that we have attributed to him "a desire to 'escape' from complying with our 'behest'"—that is to say, the suggestion for more figures. That is a deviation from fact; our remark being: "We are not disposed to let him 'escape' the sole point that raised this correspondence—that it is unfair before any body of men inexpert in gas finance to quote the average figures as to capital per million cubic feet of the local authorities and gas companies, without fully explaining certain conditions that tend to the widening of the difference between them." That is a distinct variation from the rendering of our correspondent. The suggestion for a comparison of an equal number of fairly comparable company and local authority undertakings was made because it was believed there would be interest in weeding out from the companies the small and heavily capitalized concerns. But Mr. Hunt cripples investigation and minimizes interest by not giving us the names of the concerns and the details (which he must have got out) composing the totals published in this week's letter. If consideration for our space induced economy on his part, it is a matter for regret, after the invitation given to him on July 23. The matter is one of importance to gas companies; and if the result of this correspondence induces a modification of, or the putting of a different complexion on, such statements as were made in the Presidential Address at Dublin and before the House of Lords Committee on the Hull Bill, we shall be abundantly compensated for the space and time devoted to this correspondence. Now as to the figures. We need not quote the statement made by Mr. Hunt in his Presidential Address to the Institution, because it was almost word for word in accordance with his evidence before the Lords Committee on the Hull Bill. This is what he said on the latter occasion, and we ask particular attention to the italicized words:

The Board of Trade returns for 1905 showed that the total capital indebtedness on gas-works account of the local authorities owning gas undertakings, after the deduction of sinking funds, was at the rate of £471 per million cubic feet sold, as compared with £712 in 1882. They also showed that the capital of gas companies had *increased during the same period from £724 to £840* per million cubic feet sold. The latter figure was *largely attributable* to stock conversion by many of the companies; but as the local authorities had usually had to pay large sums for goodwill, *the comparison held good.*

We say that this comparison, as laid before the Lords Committee, does not hold good. If we analyze the figures given by Mr. Hunt in his present letter, what do we find—that, taking the 143 companies which he submits as comparable with a similar number of local authority undertakings, and deducting the amount added on conversion of stock, that, far from their capital per million cubic feet having increased, it has been reduced from £694 per million cubic feet in 1882 to £595 in 1905, and without the operation of a sinking fund. This gives a distinctly different impression from the statement made before an inexpert committee that "the figures also showed that the capital of the gas companies had increased during the same period from £724 to £840 per million cubic feet sold, &c." We do not think that Mr. Hunt will suggest that the difference between £595 and the £840 quoted by him before the Lords Committee—that is to say, £245 per million, or 37,738 millions, multiplied by £245—represents stock conversion in the case of the 143 companies he has chosen in compiling his present figures. If he does not, then there is no justification for the words we have italicized in the quotation from the report of his evidence. We cannot see any particular usefulness in the last figures of Mr. Hunt's table as to the total increase of capital since 1882, and the increase of capital per million cubic feet of additional gas sold. They do not show that the local authorities have provided for the increased consumption at any cheaper rate than the gas companies. All the total figures show is the salutary effect of the sinking funds from 1882, coupled to the good industrial day-demand for gas that most of the local authorities enjoy over provincial and suburban gas companies, the higher average consumption of gas per mile of main by nearly ½ million cubic feet, about 46 more consumers per mile of main, and other beneficial conditions owing to situation and general environment—most of which have greatly improved during the past quarter of a century. Mr. Hunt is to be thanked for having conclusively proved that there is a fairer way of presenting these figures as to capital than the one adopted by him in his evidence before the House of Lords Committee. So far as our correspondent wishes to emphasize the necessity on the part of companies of taking all legitimate means of reducing capital by writing off for depreciation and by proper allocation of expenditure between capital and revenue, we are in full accord with him.—ED. J. G. L.]

The Gaslight and Coke Company's Rules for Workmen.

SIR,—The thanks of the gas profession are due to Mr. F. W. Goodenough, and to the Governor of the Gaslight and Coke Company (Mr. Corbet Woodall), for publishing in your columns the printed rules issued to the fitters and other men employed in the department controlled by Mr. Goodenough. Although the rules emanate from the largest outside department in the country, there is a good deal in them that can, with advantage, be reflected upon by those in control of the smallest. It is impossible for me to return thanks in the practical way of responding to the invitation for "further opinion or experience," for the rules appear to be already complete in every respect. As, however, I had the presumption to suggest their publication, I feel that it is due from me to express my personal indebtedness to Mr. Goodenough for his ready response.

Longwood, Aug. 5, 1907. JNO. HY. BREARLEY.

Gas, Electricity, and Water Supply of Tunis.—According to the report presented at the last meeting of the Tunis Gas, Electricity, and Water Company, there was no increase in the consumption of gas last year; but that of electric current was much higher, as shown by the fact that the number of consumers rose from 383 to 519. More water was consumed in both the city and the suburbs; 300 additional consumers being placed on the books. About 418 million gallons of water were distributed last year, compared with 371 millions in 1905.

Gas Preferred to Electricity in Manchester.—The minutes of the Gas Committee submitted at last Wednesday's meeting of the Manchester City Council contained a memorandum respecting the rearrangement of the lighting of St. Peter's Square by incandescent gas-burners; and Mr. Kemp asked whether the time had not arrived for the substitution of electricity in the lighting of the public squares of the city. Alderman Gibson, the Chairman of the Gas Committee, replied that he would raise no objection to the lighting of the square being placed in the hands of the Electricity Committee, but the Gas Committee had already been put to considerable expense, and he intended St. Peter's Square to be one of the best lighted parts of the city. Alderman Copeland observed that, as far as street lighting was concerned, electricity had been proved to be inferior to gas. An amendment to refer the matter back to the Gas Committee was rejected by a large majority.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons, read the first time, and referred to the Examiners: Metropolitan Water Board (Charges, &c.) Bill, Metropolitan Water Board (Various Powers) Bill.

Bill read the third time and passed: Llandrindod Wells Gas Bill.

Bills Royal Assented: Annfield Plain and District Gas Bill, Ashton-under-Lyne, Stalybridge, and Dukinfield (District) Water-Works Bill, Birkenhead Corporation Water Bill, Broadstairs and St. Peter's Urban District Water Bill, Coventry Corporation Water Bill, Gas and Water Orders Confirmation Bill (No. 2), Kingston-upon-Hull Corporation Bill, Portishead District Water Bill, Selsey Water Bill, Sheffield Corporation Bill, Tynemouth Corporation (Water) Bill.

HOUSE OF COMMONS.

Tuesday, Aug. 6.

METROPOLITAN WATER BOARD (CHARGES, &c.) BILL.

The consideration of this Bill, adjourned from the 23rd ult. (see *ante*, p. 331), was resumed to-day.

Mr. BURDETT-COUTTS moved an amendment to the clause sanctioning rebates in certain cases, to the effect that the benefit of the rebate be given to persons assessed from £200 per annum, instead of £300 as drafted in the Bill. He submitted that the change proposed by him would benefit a large class of shopkeepers and business men, who needed a rebate more than persons assessed for business premises at £300 per annum and upwards.

Mr. E. B. BARNARD (the Vice-Chairman of the Metropolitan Water Board) said the promoters could not accept the amendment for financial reasons. It was quite impossible for the Board to grant any more concessions.

Sir F. BANBURY, in supporting the amendment, remarked that a deficit could be met by a rate-in-aid.

Mr. BURNS said the amendment, if adopted, would have a serious effect upon the finances of the Board; and the inevitable effect would be that the poorer customers—those assessed at very much less than £200 per annum—would have to pay more than was proposed in the Bill. If the deficiency could not be covered in this way, a rate-in-aid would have to be incurred. He pointed out that the Committee who had considered the Bill had all the arguments before them, and had heard witnesses on every point which could be raised. After most careful consideration, extending over many sittings, they had decided that what the Board proposed to do in this matter was fair and equitable to everybody.

Upon a division, the amendment was rejected by 184 votes to 24.

Sir F. BANBURY moved an amendment to the same clause, to the effect that the rebate or discount instead of being from 20 per cent. to 30 per cent. be 30 per cent.

The amendment was negatived by 173 votes to 20.

On the clause dealing with supply by measure,

Mr. COOPER moved an amendment to the effect that the charge for any supply furnished by the Board under the provisions of the clause should be at the fixed rate of 8d. per 1000 gallons.

The amendment was negatived without a division.

An amendment to alter the clause relating to the supply of water for building purposes was negatived without a division, as was also one to strike out the clause dealing with the recovery of rates by action.

The debate was continued to an early hour on Wednesday morning; and at the close the Bill was reported for third reading.

Thursday, Aug. 8.

EXPORT DUTY ON COAL.

Mr. MARKHAM asked the Chancellor of the Exchequer whether, seeing that the present inflated prices of coal are injurious to the industries of the country and inflict hardship on small consumers, he will consider the desirability of appointing a Committee to inquire and report whether an export duty on coal could be imposed, without injury to the best interests of the trade, after the price of coal reaches a point which gives a fair return to the colliery owner on his capital and to the miner for his labour.

Mr. ASQUITH thought an inquiry of the kind suggested would not add anything to the information already available on the subject of an export duty on coal or its economic effect.

Mr. MARKHAM asked the right honourable gentleman if he was aware that coal was now fetching 21s. a ton at Cardiff which was being sold at 14s. a ton while the export duty was in force.

Mr. ASQUITH said possibly that was so.

The following further progress has been made with Bills:—

Bills read the third time and passed: Metropolitan Water Board (Charges, &c.) Bill, Metropolitan Water Board (Various Powers) Bill.

Award in the Wolstanton Gas Arbitration.—Mr. A. J. Ram, K.C., the Umpire in this arbitration, the proceedings in which were reported in the "JOURNAL" for the 30th ult. (p. 339), has made his award, as follows: For mains, pipes, and works, £9357; for severance, £895; and for loss of revenue, £11,124. The last two items are subject to the decision of the Court as to whether the Corporation of Burslem are entitled to recover anything in respect of severance or loss of revenue. The claim was for upwards of £32,000; and the total amount of the award is £21,376.

BIRKENHEAD CORPORATION WATER SCHEME.

House of Commons Committee.—Tuesday, July 23.

(*Before Mr.* ARTHUR STANLEY, *Chairman, Mr.* GOOCH, *Mr.* PEARSON, *and Mr.* HAWORTH.)

The Bill by which the Birkenhead Corporation seek power to obtain a supply of water from Wales came under consideration to-day. As deposited, it contemplated the construction of three reservoirs—the Alwen, the Brenig, and the Glan Alwen. In the course of the hearing by a Committee of the Upper House, presided over by Lord Newton, the extent of the scheme was somewhat reduced by directing the omission of the proposed Glan Alwen reservoir; and it was in this form that the Bill came before the Commons' Committee. The only opponents now were the Corporation of Liverpool, the Chester County Council, the Chester Water Company, the Wirral Rural District Council, and the Wirral and West Cheshire Water Companies.

The consideration of the Bill had been delayed in consequence of the action of the Board of Trade, who, in view of the possible injurious effect upon the navigation of the tidal portion of the River Dee by the abstraction of water from its tributaries, appointed Mr. L. F. Vernon-Harcourt, M.Inst.C.E., as an Inspector to inquire and report to them (1) as to what extent, if at all, the proposed works and abstraction of water sought to be authorized by the Bill were likely to affect injuriously the navigation of the tidal portion of the river; (2) whether such injury could be prevented or remedied by dredging or other works; and (3) what would be the probable annual cost of the same, and by what authority they would be best carried out. Mr. Vernon-Harcourt reported at some length on the questions submitted to him, and came to the following conclusions: "(1) I consider that, in the present condition of the tidal Dee, any abstraction whatever of fresh water would be, in proportion to its amount, injurious to the river. (2) I am of opinion that any injury caused by the proposed abstraction of fresh water by the Birkenhead Corporation could be remedied by dredging. (3) I estimate that the cost of the dredging necessary to remedy any such injury would amount to £316 a year; and I think that the body most fit to undertake the work would be the Dee Conservancy."

Mr. BALFOUR BROWNE, K.C., the Hon. J. D. FITZGERALD, K.C., and Mr. GERALD FITZGERALD appeared for the promoters; Mr. WEDDERBURN, K.C., represented the Corporation of Liverpool; and Mr. SQUAREY the Wirral Rural District Council.

The CHAIRMAN, at the outset of the proceedings, referred to the delay in the consideration of the Bill at the request of the Board of Trade.

Mr. BALFOUR BROWNE said that when the Committee knew the circumstances of the delay, and what had happened, they would see that, though some expense might have been caused thereby, on the whole it had been of advantage, inasmuch as it had resulted in a very satisfactory arrangement being arrived at with the River Dee Conservancy. He then related the circumstances which had convinced the Birkenhead Corporation that the time had arrived when they should seek to obtain an independent, and, if possible, a gravitation source of water supply; and he referred to inquiries into the question which had been made by a Committee of the Corporation, and which culminated in a report from Dr. G. F. Deacon recommending the present scheme. He also described the negotiations which had taken place between 1903 and 1906 with the Liverpool Corporation, and their failure (though they had proceeded so far that heads of agreement were arrived at between Committees of the two Corporations), owing to the refusal of Liverpool to enter into an undertaking to give Birkenhead a permanent and unlimited supply of water. It was only after the failure of these negotiations that Dr. Deacon's scheme was finally adopted by the Birkenhead Corporation. The learned Counsel then outlined the scheme, as fully explained by him in the proceedings before the Committee of the House of Lords, already reported, and pointed out the changes made in the Bill, the effect of which was, he said, to cut down the scheme, and diminish the abstraction of water from the Dee. The dry-weather flow, if the Corporation had not promoted this scheme, would have been 1,221,846 gallons a day. It was originally proposed to increase it, by means of compensation water from the reservoirs, to 4,652,517 gallons; but, as the Committee of the House of Lords raised the proportion of compensation water to one-third, the minimum flow would now be 6,203,557 gallons. It had to be borne in mind that they were not affecting the whole drainage area of the River Dee. The total drainage area of the Dee was 675 square miles; and they were affecting only 17·69 square miles. The flow of water over the weir at Chester was 750 million gallons a day. The total abstraction, when all the Corporation works were completed, would only be about 12½ million gallons. Counsel then passed on to refer to the petitions against the Bill. Dealing first with that of the Chester County Council, who objected to the permissive nature of clause 56 ("Power of Corporation to Supply Local Authorities, Companies, or Persons"), he said they entirely objected to be put under a compulsory obligation to supply people on the route of the viaduct, as it would be making Birkenhead the water authority for the whole of the district through which the pipe ran. As to the petitions of the Water Companies, the Corporation objected to supply them with water, as they demanded, at cost price. The only effect of this would be to enable them to secure larger profits at the expense of the consumers of Birkenhead, on whom this scheme would throw a slightly increased charge for water as compared with what they were paying now. The essence of the opposition of the Liverpool Corporation was contained in the following paragraph of their petition: "Your petitioners strongly object to the conferring upon the Corporation of any powers to supply water within the area already assigned by Parliament to your petitioners, and particularly within the area of the Urban District Council of Wallasey, as your petitioners have entered into an agreement with that Council for a supply of water in bulk; and the granting of the powers contained in section 56 of the Act would cause serious loss and inconvenience to your petitioners." His comment upon this was that the area referred to was not assigned to the Liverpool Corporation at all. It was only an area in which they might supply by agreement. It was not part of their water area, as Birkenhead was part of the Corporation's water

area. The Vyrnwy Act only gave the Liverpool Corporation permissive power to supply water *en route* if the people chose to take it from them; and they were prohibited from going into any person's district without the consent of the local authority or company supplying. He was perfectly willing to recognize the agreement the Liverpool Corporation had made with Wallasey. It purported to be in perpetuity; but it could be put an end to by five years' notice. He was not going to recognize any other right of Liverpool to supply Wallasey.

Mr. WEDDERBURN: Are you ready to say that you will not supply Wallasey as long as we are willing to do so?

Mr. BALFOUR BROWNE said he was not. He thought it would be an improper thing for him to bind himself in no circumstances to supply Wallasey; and he believed it would be a very good thing for her to have two strings to her bow. Passing to the petition of the Chester Water Company, Counsel said that Birkenhead was there referred to as "only a suburb of Liverpool." "This," he said, "is only meant to insult us." Birkenhead is not a suburb of Liverpool. His comment on the joint petition of the Wirral and West Cheshire Water Companies was that the Corporation did not intend to compete with any water company who were actually supplying in an area.

Evidence was then given for the promoters.

Alderman *Bloor*, the Chairman of the Gas and Water Committee of the Birkenhead Corporation, said the Committee considered every scheme that anybody could think of, including the possibility of getting a supply of water from Manchester and Liverpool. They exhausted every reasonable source of supply nearer home before embarking on the present scheme. The Corporation consulted Sir Alexander Binnie, Professor Boyd Dawkins, and other experts; and their reports entirely justified the recommendations of Dr. Deacon. There was no desire on the part of the Corporation to compete with Liverpool in the supply of water to places on the route of the proposed viaduct; nor did they wish to interfere between Wallasey and Liverpool.

Mr. WEDDERBURN: Are you content, so long as Liverpool is able and willing to supply Wallasey, that you will not interfere?

Witness: I do not go so far as that; but as long as the present agreement remains in existence, we have no wish to disturb it.

You do not desire to be in the position of inducing Wallasey to give notice to Liverpool when otherwise they would not do so?—We desire to be in a position to supply water if circumstances should make it mutually advantageous. We have no wish to induce Wallasey to leave Liverpool.

Would you be willing to come to such arrangement as this—that Liverpool should say that, where you had agreed to supply to any particular local authority or person, Liverpool would not compete with you in regard to that supply so long as you were ready to continue it; and that you, on the other hand, should say that where Liverpool agreed to supply any local authority or person you should not come in?—I would not like to answer that question. I am only one individual, and I am not authorized in this respect to speak on behalf of the Corporation.

Although there is a risk to Liverpool as regards Wallasey, Liverpool is to have no protection?—The risk is so slight that I think they need not trouble themselves about it.

In answer to Mr. SQUAREY, witness said that if the Bill became law, the Corporation would be under compulsion to supply all the districts in regard to which they had made agreements. He was not prepared, however, to put in the same position those authorities on the line of the viaduct with whom agreements had not already been made.

In re-examination by Mr. FITZGERALD, witness said he recollected Lord Newton saying in the other House that he was agreeably surprised at the moderation of Birkenhead with regard to Liverpool, and that it seemed to him that Liverpool had no better right in the Wirral Peninsula than Birkenhead.

The CHAIRMAN: The construction you put on clause 56 is that you will not supply water within the area of any local authority or company without the consent of that local authority or company?

Witness: That is so.

Do you hold that this entirely covers any question of competition?—That is our contention.

About this agreement between Wallasey and Liverpool, I understand it is meant to be a permanent agreement, but it is terminable on five years' notice on either side, and the cost of the main is to be borne by Wallasey and spread over 30 years?—If Liverpool terminates the agreement, Liverpool would have to return the money already paid by Wallasey in respect of the main. If Wallasey brings the agreement to an end, Wallasey will have to continue to discharge its obligations with regard to the main.

So that neither side can break the agreement for 30 years without suffering financial loss?—That is so.

Sir *Thomas Stevenson* spoke of the salinity of the wells from which the present water supply of Birkenhead is derived, and expressed the opinion that the Corporation had done a prudent thing in coming for a pure supply of water such as the scheme contained in the Bill would provide.

Wednesday, July 24.

On the resumption of the inquiry this morning,

Mr. WEDDERBURN, referring to Alderman Bloor's reply to the Chairman on the previous day, that neither Wallasey nor Liverpool could break the existing water agreement without suffering financial loss, said this was a mistake. Liverpool could not do so, but Wallasey could.

The CHAIRMAN: Liverpool would have to pay for the mains?

Mr. WEDDERBURN: It goes farther than that; but I will explain the position fully at a later stage.

Mr. *Benedict Jones*, the Chairman of the Parliamentary Committee of the Birkenhead Corporation, gave evidence confirmatory of Alderman Bloor's statements as to the character of the present well water and the necessity for obtaining a fresh supply. He said he had himself pressed this necessity upon the Council for more than ten years. The town was unanimously in favour of the present scheme. The whole of the local authorities along the line of pipe who were not within a company's water area had been agreed with by the Corporation. The works and viaduct were situated in Denbighshire and Flintshire; and the Councils of these counties were satisfied.

The CHAIRMAN: Do I understand that you have agreed to give a supply of water to all the small local authorities on the line of your aqueduct from the works to where it crosses the Dee?

Witness: Yes, with all who have asked us. I think I can safely say that we have covered the whole of the ground except Connah's Quay and Buckley, which are under Companies. With these exceptions, all local authorities who have applied to us have the same agreement at 6d. per 1000 gallons; but the whole of them only come to a maximum daily demand of half-a-million gallons.

Dr. *G. F. Deacon*, the Engineer of the scheme, said it was the only available one for Birkenhead, without following the circuitous route of the River Dee. The quality of the water was perfect, except that in the case of the Alwen there was the drawback of the presence of peat beds. Arrangements had been made to remove the peat which was in the reservoir area, and to drain the rest, so that the water would be quite white before it reached Birkenhead. Having repeated the figures given by Mr. Balfour Browne as to the size and capacity of the reservoirs and the length of the aqueduct, witness passed on to the cost of the scheme. He said the estimate for the Alwen reservoir and the first line of aqueduct was £758,252. This included lands and easements for the completed works. The estimate for the Brenig reservoir and the second line of pipe was £530,000. The first figure worked out at £108,320, and the second at £101,845, per million gallons per day, which was, by comparison with other similar schemes, a low cost. The growth and development of Birkenhead would, according to his calculations, necessitate the construction of the Brenig reservoir not later than 1921. Taking the whole scheme, they were, at the very outside, looking only 44 years ahead in the matter of water supply. Dealing with the petitions, witness said the Chester Water Company would be greatly benefited by the increased dry-weather flow of the river which would result from the compensation water sent down from the reservoirs. It was not true that the Chester Water-Works would not get the compensation water. As to the petition of the Liverpool Corporation, there was no intention to interfere with the existing contract between Wallasey and Liverpool.

In cross-examination by Mr. WEDDERBURN, witness said there was no doubt in his mind that the Wallasey agreement was not to be interfered with; but if the Wallasey people chose to exercise their prerogative, and give up the supply from Liverpool, he did not see why they should not do it.

Mr. WEDDERBURN: Supposing Birkenhead found they had surplus water, do you think it fair that they should say to Wallasey, "We will supply you at less than the price at which you are getting your supply from Liverpool and at which we are supplying our own people," so as to persuade Wallasey to come away from Liverpool?

Witness: I think it would be very wrong to impose a condition of that kind—to limit the price by reason of the supposed cost of the water to Birkenhead.

Would it be a right and fair thing to sell at a loss?—If Birkenhead could afford to do so, I do not see why they should not do so.

At a very low price?—I think at such a price as they can afford, having regard to all the circumstances.

Mr. MOON, K.C., for the Chester Water Company, questioned the witness in considerable detail for the purpose of showing that he had over-estimated the rate at which the population of Birkenhead would increase, and on which he had based the period of duration of the water supply, and also that the estimate of consumption of 41 gallons per head of the population was higher than any other town in the country similarly situated to Birkenhead. Mr. Deacon refused to assent to either of these propositions. In regard to the first, he gave it as his opinion that the rate of increase of population in Birkenhead would not diminish during the next fifty years; while as to the second, he quoted figures to show that the water consumption per head was larger in many towns than he had estimated for Birkenhead.

Mr. BALFOUR BROWNE (to witness): Your attitude with regard to Wallasey is, that if they cease to take water from Liverpool, they should have an opportunity of agreeing with you if they choose; and with regard to Wirral, you want them to be free to agree with you if the Companies consent?

Witness: Certainly.

You do not propose to compete with the companies supplying water in detail?—Certainly not.

And the only competition you are speaking of is between two authorities who are not compellable to supply, but can supply in bulk?—Certainly; and I think that is fair.

In reply to Mr. WEDDERBURN, witness said an old calculation of his showed that the cost of bringing water to Birkenhead from the Alwen reservoir alone in 1916 would be 5·2d. per 1000 gallons. This figure would now be modified by the inclusion of Chester and the other outsiders. In 1936, when the Brenig reservoir would have been constructed, the cost would be 6·2d. per 1000 gallons. He could not possibly say what the cost of the bulk supply would be.

Thursday, July 25.

On the re-assembling of the Committee this morning,

Mr. FITZGERALD stated that the proportion of the estimate for the Alwen supply which related to the works from the source down to the nearest point to Chester was £603,644, and for the complete works £1,003,000.

Sir *Alexander Binnie* said he had made himself acquainted with the scheme prepared by Dr. Deacon. The sizes of the reservoirs were remarkably good, both from the engineering point of view as to construction and for the purity of the water they were likely to impound. The scheme presented no engineering difficulties whatever. He corroborated Dr. Deacon's evidence as to the effect of the compensation water, which, by the decision of the Lords' Committee, was a larger proportion than had been given in the other Welsh water schemes, on the flow of the Dee, and as to the deterioration of the present sources of supply owing to the increasing salinity of the local wells.

In reply to the CHAIRMAN, witness said he was not of opinion that the Chester Water Company would be adversely affected by the dimi-

nution in the flood water. It would be an advantage to them to have in dry weather a large quantity of water sent down to them which they did not get at the present time.

Mr. *G. H. Hill* also expressed approval of the scheme.

Mr. FORBES LANKESTER at this point intimated that the opposition of the Chester Water Company was about to be withdrawn.

Mr. FITZGERALD said that with the withdrawal of the Chester Water Company the remaining opponents were contesting the Bill on points which were substantially clause questions, and therefore he did not think he ought to take up any further time with evidence.

This closed the case for the promoters.

Mr. SCOTT addressed the Committee in the interests of the Wirral and West Cheshire Water Companies, who asked that they should be protected by name against the competition of the Birkenhead Corporation. His suggestion was that a sub-section should be introduced providing that the Corporation should not supply water so as to be used within the limits of supply of the Companies, otherwise than by supply in bulk to the Companies, or with their consent in writing, both to be mentioned specifically by name. Without such protection he feared there would be a temptation on the part of the Birkenhead Corporation to supply in competition with the Companies.

Mr. SQUAREY, on behalf of the Wirral Rural District Council, said they opposed the Bill on three grounds: (1) That there was insufficient protection to them as the sanitary authority in respect of their sewers; (2) that there was an absence of any undertaking or agreement to supply them with water in the event of the two Companies consenting to their being so supplied; and (3) the price which they ought to pay for such a supply. So long as the existing Companies had water enough for the population of Wirral, they would, of course, continue to supply them. But they had it on the authority of Dr. Deacon, Sir Alexander Binnie, and Mr. Hill, that the present sources were precarious, and when the supply failed the District Council must look elsewhere for water. It was obvious that when that time arrived they must look to Birkenhead; and what they asked for now was that they should be placed on exactly the same footing as many other people had been by the Birkenhead Corporation.

Mr. CLEASE asked that the Chester County Council, for whom he appeared, should be invested with the right to demand, on the failure or inability of an authorized company, or the failure of a local authority, to afford it, a supply of water from the Birkenhead Corporation, on terms which should not be onerous. He asked the Committee, if they passed the preamble of the Bill, to put an obligation upon the Corporation to supply any local authority within five miles of the aqueduct and in the county of Chester with water if they demanded it, and providing that the amount to be paid by the authorities should either be fixed by arbitration or be such as Chester herself paid.

The case for the Liverpool Corporation was then opened.

Alderman *Burgess*, the Chairman of the Water Committee of the Liverpool Corporation, in answer to Mr. JEEVES, stated that the Wallasey people were in considerable straits as to their water supply, and, though Liverpool had not then completed the laying of the second pipe line from Vyrnwy, the Corporation decided to relieve the anxieties of Wallasey by undertaking to furnish them with a minimum daily supply of 500,000 gallons, and a maximum daily supply of 2,500,000 gallons. The price fixed was 6d. per 1000 gallons. The Corporation borrowed £105,000 for the cost of the main, and Wallasey undertook to repay the amount over a period of thirty years. The Corporation were liable for the rates on the main, which amounted to about £500 a year. The agreement was for a period of thirty years, terminable on five years' notice on either side. But, in order to make the position as permanent as possible, it was provided that if, within the period named, Liverpool should give notice, they were to pay the whole cost of the main. The Corporation would then have to return to Wallasey all the payments made by them in respect of sinking fund and accumulated interest, and would be penalized to the extent of £107,000. On the other hand, if Wallasey chose to determine the agreement, they were at liberty to do so; and in such event they merely had to pay cash down for what, under the agreement, they had paid by instalments. In reply to further questions, witness said Wallasey was only taking now the minimum of half-a-million gallons; but the Liverpool Corporation were obliged to hold in reserve for them an additional 2 millions. If the time ever came when Liverpool could not afford to give their supply to Wallasey, it would be necessary to go for more water for Liverpool.

Mr. JEEVES: Do you consider that, having come to the help of Wallasey in their time of need, you ought to have such provision inserted in this Bill as shall protect you against a scheme that could not have been thought of or considered when you went to the relief of Wallasey?

Witness: I think so. So long as we are able to supply Wallasey from the line of pipe, I think we ought to be protected.

In answer to the COMMITTEE, witness said, supposing Wallasey were to break the agreement, quite apart from any profit that Liverpool might get from the 6d. per 1000 gallons, he thought Liverpool would not lose any money.

Mr. *Joseph Parry*, the Engineer-in-Chief of the Liverpool Corporation Water Department, speaking of the Wallasey agreement, gave it as his opinion that it would not be fair that Birkenhead should now come in and have a right to compete with the Liverpool Corporation in the supply of water in the Wallasey area; nor did he think it would be wise from the point of view of public policy. Having given Wallasey a supply in pursuance of the agreement, he thought Liverpool ought to be protected, so that they might get from it the benefit they had a reasonable right to expect. If the Wallasey main were to become of no value in the supply of water, the capital which had been expended upon it would be wasted; and this would throw a burden on the ratepayers of Liverpool. He would like to point out to the Committee that the agreement really meant that, Wallasey having been in difficulties with regard to its water supply, was secured now to the extent of 3 million gallons a day at the expense of Liverpool.

Mr. WEDDERBURN then addressed the Committee on behalf of the Liverpool Corporation, who, he said, had desired all through to be fair in this matter both to Birkenhead and to Wallasey. He thought there could be no question in the minds of the Committee that this was a Bill to supply Birkenhead, and not one to constitute the Birkenhead Corporation the water authority for places other than Birkenhead. What the Corporation were seeking was power to supply, if they thought fit, places which were not along the line of route. He did not think it could fairly be said that the bargain which Liverpool made with Wallasey was a hard one, or anything like it; nor could it very well be said that Wallasey was in any sense discontented with it. Liverpool could only terminate the agreement at the cost of taking over the main; and having taken it over, they were prevented from using it to supply any other authority. Therefore the agreement, so far as Liverpool was concerned, was clearly intended to be a permanent one. The question for the Committee was: Was there any danger of this Birkenhead proposal adversely affecting Liverpool in regard to Wallasey? The risk was that if Liverpool was not protected, Birkenhead might at once undersell her, and so induce Wallesey to give up the agreement. It would be against public policy to refuse protection against such a risk, because of the sense of insecurity it would give. The principle of competition between water authorities had never received the assent of Parliament. He therefore asked the Committee to exclude Wallasey. If they were with them on the principle that there should be no competition, he asked them to go further, and say there was to be no competition in regard to agreements once made. Thirdly, he asked that Birkenhead should not be allowed to supply outside places at a cheaper rate than they charged inside.

The case for the opponents then closed.

The Committee having deliberated,

The CHAIRMAN said: We find that the preamble of the Bill is proved, subject to the insertion of the sub-clauses submitted by the Wirral and West Cheshire Water Companies for their protection, and subject also to a proviso that Birkenhead shall not at any time before 1930 supply water to consumers in Wallasey at a cheaper rate than is at that time being paid by consumers in Birkenhead. This leaves the question of disturbances of mains and sewers to be raised on clauses.

Mr. FITZGERALD: If you say "at a cheaper rate than is supplied in bulk in Birkenhead," that is fair; you are comparing two things that are alike. But if you mean that the actual charge made to the individual consumer in Birkenhead is to be the guiding principle, there would be a difficulty.

Mr. WEDDERBURN: I think we see what the Committee mean, and will be able to come to an agreement.

The next day the clauses were adjusted, and the Bill was ordered to be reported.

Additional Capital for the Northampton Gas Company.—At the conclusion of the annual general meeting of the Northampton Gas Company last Thursday, at which a dividend at the rate of 5 per cent. per annum was declared on the consolidated stock, the Directors were authorized to raise £20,000 of additional capital.

Hereford Ironmongers and Gas-Fitters and the Gas Committee.—At the monthly meeting of the Hereford Town Council last Tuesday, a petition was presented from the ratepayers trading as ironmongers and gas-fitters, complaining that a circular issued by the Gas Committee with respect to the maintenance of incandescent gas-lights was a serious attack on their businesses, and likely to give rise to unjustifiable competition. They stated that a scheme on similar lines had been provided by private enterprise, and had been in operation for several years. The matter was referred to the Gas Committee.

Incandescent Gas Lighting at Leatherhead.—At the annual meeting of the Leatherhead Gas Company last Wednesday, the Chairman (Mr. F. H. Williams) mentioned that since the previous meeting a five years' contract had been entered into with the Leatherhead Council for the public lighting, at the rate of £3 6s. 6d. per lamp per annum—a reduction of 2s. per lamp, on the former rate. One of the conditions of the contract was the conversion of the remaining 36 flat-flame burners to the incandescent system. This had been done, and he thought the shareholders would agree with him that the whole place was very well lighted.

Tar Painting for Roads.—At the meeting of the Hereford Town Council last Tuesday, the Roads Committee recommended the tar painting of the surface of a certain road, as they were informed that the cost of watering and scavenging would thereby be reduced to such an extent as to justify the slightly increased first outlay. The City Surveyor (Mr. J. Parker), on being asked his opinion on the matter, said his mind had been made up for some time. There was no question about tar macadam and tar painting very materially increasing the life of the road; and in the end the cost—spread over a period of six or seven years—would be cheaper. It would save the scavenging and water, and the places already done did not take half so much watering as the others. Tarred roads were bound to come, not on account of the dust nuisance, but of the extra repairs. It did not cost 1d. a square yard to do, and it nearly saved itself in one year. The recommendation was adopted.

Aldershot Gas and Water Supply.—At the half-yearly meeting of the Aldershot Gas and Water Company on the 2nd inst., the Directors reported that the revenue in the six months ending the 30th of June was £27,588, and the expenditure £20,119; leaving a surplus of £7469. After providing dividends on the preference shares and interest on the preference stock, mortgage, and debentures, the Directors recommended dividends at the rates of £11 19s. and £8 19s. per cent. per annum on the shares subject to the sliding-scale, and at the rate of 7 per cent. per annum on the ordinary shares, less income-tax. In the course of his remarks when moving the adoption of the report, the Chairman referred at some length to the rise in the price of coal, and hinted that this might mean an increase in the price of gas; but hopes were held out that no advance would be made in the near future. With regard to water, the Chairman expressed his pleasure in congratulating the proprietors in respect to the security of the supply and the maintenance of its purity. The report was adopted, and the thanks of the meeting were accorded to the Chairman, Directors, staff, and servants of the Company for their services; the compliment being acknowledged by Mr. W. T. Robertson and the Secretary and General Manager (Mr. R. W. Edwards).

MISCELLANEOUS NEWS.

SOUTH SUBURBAN GAS COMPANY.

The Half-Yearly Meeting of this Company was held on Friday, at De Keyser's Royal Hotel, Victoria Embankment, E.C.—Sir GEORGE LIVESEY in the chair.

The SECRETARY (Mr. Chas. M. Ohren) read the notice convening the meeting; and the Directors' report and the statement of accounts were then taken as read.

A PROSPEROUS HALF YEAR IMPROVES FINANCIAL CONDITION.

The CHAIRMAN, in moving the adoption of the report and accounts, said he would first deal with the latter. The accounts, the Directors said, were satisfactory—in fact, he might say they were very satisfactory, because the coal carbonized was supplied at last year's prices through nearly the whole of the half year; and they had had the benefit of the increased value of coke during the whole of the half year. What had they done with the money? The Directors told the proprietors that there was a slight increase in the amount carried forward. In the previous half year, they had not quite sufficient profit to pay the dividend and interest; while in the current half year there was a considerable surplus. The Directors had partly devoted this surplus to increasing the insurance fund, making it £20,113. The fund was granted by Parliament to enable the Company to meet any extraordinary or unexpected accident—for instance, such a thing might happen as an explosion of gas, and some valuable premises might be wrecked. If, in such an event, the Company had not a fund from which to meet such an unavoidable thing as this, it would seriously affect their dividend. He did not think that £20,000 was a penny too much for this purpose. They were allowed by Act of Parliament to accumulate an insurance fund equal to 5 per cent. on the cash capital raised; and as this was £470,000, they were entitled to have £23,500 as an insurance fund. The Directors had also taken advantage of the prosperous half year to put the interest of the reserve fund to the credit of the fund. It would not be at all a bad thing if the reserve fund were brought up to 10 per cent. on the paid-up capital—that was, the cash capital. The reserve fund now stood at £43,000; and £4000 was wanted to bring it up to the 10 per cent. When this was done he thought the Company would be in as safe a position as possible in regard to their funds. The Directors had done something else. They had in the December half year a suspense account in the balance-sheet of £6697. Of this amount, £5000 was due to the extension and alteration of one of the retort-houses. Part of the expenditure on the house was paid from capital, and part of it ought to come out of revenue. They could not meet it out of revenue in the last two or three years, which were short in profit; and so £5000 was carried to suspense at Dec. 31 last. There was also £1697 put to suspense for trucks. They had now paid off this £6697; and so the suspense account was cleared off altogether. After doing this, they had slightly more to carry forward than they brought forward.

THE EFFECT OF THE INCREASED PRICE FOR GAS.

It might be said, Why increase the price of gas, with a surplus such as they had had on the half year? As he had already explained, the surplus was due to coal at last year's prices, and coke at this year's prices. The new contracts for coal began to run towards the end of last half year at such increased cost that the Board did not feel it was a proper thing to deplete their reserve fund to make up the extraordinary additional expenditure so caused. The Directors therefore resolved that the price of gas must be increased. The effect of this on the proprietors would not be serious. At the price of 2s. 5d. per 1000 cubic feet, the proprietors were entitled to a dividend of £5 13s. 4d. per cent. But as £5 13s. 4d. per cent. was not earned in the previous half year, they did not pay it. In the past half year, they did earn it; but inasmuch as the Directors would not be able to pay the same dividend in the December half, they certainly did not feel justified in paying £5 13s. 4d. on the present occasion, to reduce it next time. Seeing, however, that they were only paying 5½ per cent., though entitled to £5 13s. 4d., the increase of price would have the effect of reducing the dividend to £5 6s. 8d., or 3s. 4d. per cent., or about £1008 a year. This was what the shareholders would actually have to give up in consequence of the increased cost of coal. If they were, on this occasion, to pay the full dividend to which the proprietors were entitled, the loss to them next half year would have been about £2016. The consumers lost by the increased cost of coal by having to pay a larger price for gas; the proprietors lost by having a smaller dividend. Then there was the third party in the partnership—the employees. They also lost. The sliding-scale system had been extended to them. The employees received on their salaries or wages a certain percentage bonus dependent on the price of gas. If (just as with the dividend of the ordinary proprietors) the price of gas went up, the bonus went down; if the price of gas went down, the bonus went up. The effect was this: The co-partnership year ended with June; and for the past year £3075 had been distributed among the employees, at the rate of 6½ per cent. on their salaries and wages. The increase of the price of gas would reduce the bonus from 6½ per cent. to 5 per cent.; and they would lose £700 a year. But he must remark here that the employees had always received the full bonus to which they were entitled; the shareholders had not always had their full dividend. What would be the effect of this? It was commonly said that there was a great deal of unrest among workmen; and that it was all very well so long as they were going on all right, and the full bonuses were being paid. But, people also commonly said, supposing the tables were turned; and there was a loss to the employees, they would begin to grumble, and the system would fail. His reply to that was this: The present was not the first time an increase in the price of gas had taken place since the co-partnership system was started. There was an increase of the price of gas in the year 1900; and a reduction of the proprietors' dividend and of the employees' bonus followed. The proprietors and the employees took the matter sensibly, and like men. There was not a word of complaint; neither would there be now. In fact, far from that, all parties had received the little reverse in the right spirit. He knew he could speak for the proprietors and for the employees, as well as for the consumers, because the Directors issued a notice as to the increase of price, with an explanation of the cause, to every one of their 36,000 consumers, and not one of them had complained. As Britishers they might, he thought, congratulate themselves that their people quite understood a position that was reasonable; and the best course the Directors had found to adopt in such a matter was to explain the whole thing—to be perfectly open and above-board—and tell consumers, employees, and proprietors exactly how the matter stood. He should be very much surprised if there was now any discontent or grumbling. They one and all accepted the fact, and hoped for better times.

THE POSITION OF THE COAL MARKET.

The coal market, he was sorry to say, had not improved since the Directors made their contracts. Instead of coal getting cheaper, it was much dearer. They made their contracts about three months ago; and the price of coal f.o.b. at the pit had gone up something like 2s. a ton in the three months. What was going to happen, one did not know; but one had a right to protest against the course that was being pursued by Parliament. There were two parties very active, and very much interested, in getting a higher price for coal—the coal owners and the coal miners. The remark had been made: "Gas shareholders get large dividends; let them give up a portion of their dividend for our benefit, and let the consumers pay more for their gas." He did not know of any body of men more capable of looking after themselves and their interests than the coal owners and the miners; and the danger was, while these people were ever watching to get all they could, the most important body of people in the kingdom, the only body that counted—that was, the consumers of coal—were left out of consideration altogether. What was Parliament doing now? They were introducing Eight-Hour Bills for coal miners. A Committee sat at the beginning of the year to inquire what would be the effect of an Eight-Hour Bill on the price of coal. A great deal of evidence was given before the Committee; and it was made pretty clear that an Eight-Hour Act would increase the cost of getting coal. A representative of one of the most important miners' unions told a friend of his (the Chairman's) that coal ought to be at least 30 per cent. higher than it was (this was only a few months ago), in order that coal owners and miners might get, as he called it, a fair profit. But so far as the miners were concerned, the larger pay they received, the less work they did. Coal owners had told him that the men would not work a full week; and when wages were high, they worked still less time. Why these men should want Parliament to limit their hours to eight per day, when perhaps they worked only four days a week, was beyond his comprehension. But this eight-hour movement was a purely socialistic one; it was prompted by the Socialists. He (the Chairman) was on the Labour Commission some years ago; and a good many of the witnesses came before the Commission, advocating an eight-hour day. The question was asked, Why an eight-hour day? And some of the witnesses were candid enough to say, "In order to absorb the unemployed." Their friends of the Gas-Workers' Union had said the same thing; and the Secretary of the Union said only the other day in the House of Commons: "By establishing a universal eight-hour day, the unemployed would be absorbed." When on the Labour Commission, he (the Chairman) put this question to a witness: "Supposing you get an eight-hour day, and supposing after that there were still unemployed men, what would you do?" The answer came promptly: "We would reduce it to six hours." Then he (Sir George) followed that up, and said: "Supposing you have a six-hour day; and there were still unemployed, what would you do?" "Then we would reduce to four," was the reply. Mr. Tillett himself said he would reduce the day to four hours; and he would compel the rich people to work a four-hour day also. That statement did not appear in the report of the Commission's proceedings. The witnesses had an opportunity of revising their evidence; and the other day he (Sir George) was looking for this statement and could not find it. As he had said, the eight-hour day was a purely socialistic movement. He was satisfied that there were few people in the kingdom who had followed this matter so closely as he had done; and the farther he went, the more clear did it become that it was all part of the scheme to enable the Socialists to appropriate the property of other people. As to giving the miners an eight-hour day, what effect would that have for them? They could take an eight-hour day, without an Act of Parliament, if they liked; they were masters of the situation. However, meantime we were suffering. This Eight-Hour Coal Miners' Committee, he was glad to see, in their report, drew special attention to the party most interested in the matter—the consumer—and they advised Parliament, in legislating for one party, to take care that they did not neglect the interests of the great bulk of the people.

THE "FURTHER STAGE" REACHED.

He should have something to say about their own employees at the extraordinary meeting to follow this one. Whatever might be the case in regard to other concerns, they were happy among themselves. Practically, all their employees were proprietors holding in the aggregate a large amount of property in the Company; and this fact rendered a strike, or anything like it, impossible. In "The Times" for Aug. 5, he read this paragraph:

> Professor J. H. Merivale delivered on Saturday his presidential address to the North of England Institute of Mining and Mechanical Engineers, at their meeting in Newcastle-on-Tyne. He dealt with the relation of the miners to capital, and said the sliding-scale and the Conciliation Board were perhaps not the most perfect means of settling industrial disputes. But, under their guidance, there had not been a general strike in Durham for more than fifteen years, and in Northumberland for more than 20 years. They were *the best methods possible* at the stage they had now reached in industrial evolution, and could not be improved, except in detail, until *a further stage was reached*, when the identity of the interests of capital and labour being recognized by everybody, as it was now by the few, disputes between capital and labour would be impossible.

This was the position, he thought he might say, that they had already reached in this Company. The identity of the interests of capital and labour were recognized by them; and disputes between capital and

labour had with them become impossible. Men could not strike against themselves. There was no possibility of a strike or any serious dispute. They had made their men partners; and last year the employees received £3075. This had the further advantage that it tended to the distribution of wealth. The great cause of unrest in the labour market was that it was felt by working men that they were not getting their fair share of the wealth produced in the country. In their Company, they were trying to make their men owners of property; and if everybody did this, there would be very little chance for Socialism.

The DEPUTY-CHAIRMAN (Mr. Robert Morton), seconding the motion, said he did not think it required any remarks from him.

A SHAREHOLDER'S COMMENTS.

Mr. JOHN BORASTON remarked that the striking points of the Chairman's address seemed to be the fairness with which the Board endeavoured to deal with the interests of the ordinary shareholders and the employee shareholders and co-partners, and the general common-sense which characterized the proceedings of the Directors. He had been particularly struck with what the Chairman had said with regard to the spread of Socialism and the connection of the eight-hour movement with that particular creed. He was convinced that the Company's scheme of co-partnership provided the best possible means of meeting the wave of Socialism which to-day was a menace, not only to the country's industrial prosperity, but he believed to its moral well-being. As to the new co-partnership scheme, this was the natural outcome of the great success of the original experimental scheme. It had been prepared with most elaborate care, and provided for all possible contingencies. The accounts which had been presented were absolutely satisfactory. There was one subject in his mind which was not strictly germane to the report—that was the prosecution recently instituted by the Lewisham Borough Council against the Company for causing effluvia in the manufacture of gas. They were a Company engaged in the manufacture of a commodity which was absolutely essential for the production of those two great necessities of modern life—artificial light and heat; and so long as they carried out their chemical and other processes with a due observance of those precautions against nuisance which the scientific knowledge of the age had placed at their disposal—so long ought they to be free from interference. It seemed apparent to him from the reports he had read that, if the case succeeded against them, it might hamper the Company materially in their very necessary industry. He did not think it would succeed; and quite apart from the technical objections taken on the part of the Company, he believed that the saving words of section 21 of the Public Health (London) Act, 1891, would in themselves be sufficient to clear the Company from any legal responsibility. He thought the words were something like this: "Unless it is shown that such person has used the best practicable means for abating the nuisance, or preventing or counteracting the effluvia." He should like to recognize the admirable nature of the evidence of their Engineer, Mr. Shoubridge, and the excellent manner in which it was given. He heartily supported the adoption of the report, and congratulated the Board on the accounts they had presented.

THE QUESTION OF NUISANCE.

The CHAIRMAN said, with reference to Mr. Boraston's closing remarks, he believed this was the position regarding gas companies and the question of nuisance: Undoubtedly while Parliament compelled the companies to use lime for purification there was an objectionable smell emanating from gas-works which would reach half-a-mile. It was the use of lime which had given such works a bad name all over the country. Their Company spent about £10,000 in four successive applications to Parliament before they got relieved from this obligation; and when they did secure relief, the smell stopped. But the gas-works had got a bad name; and people living a mile away attributed every bad smell to them. He was not going to argue the subject; but at the Police Court the Company said it was a matter of absolute impossibility that the gentlemen who signed the memorial to the Council, and were the originators of the proceedings—and who lived, the nearest about half-a-mile from the works, and some a considerably greater distance away—could have smelt the gas-works. They did not deny that these gentlemen did experience a noxious smell; but the borough did not ventilate their sewers, except by open gratings in the middle of the roads, and this the Company said was the cause of the trouble. The Company were suffering for the ill-name of the past; but he had no doubt they would live it out.

The resolution was then carried.

THE DIVIDEND.

The CHAIRMAN then moved that a dividend for the half year ended June 30 be declared at the rates per annum of 5 per cent. on the preference stock and 5¼ per cent. on the ordinary stock—less income-tax.

Mr. R. WYLLIE, in seconding, referred, as a Workman-Director and an old servant of the Company, to the co-partnership scheme. He said the men took a greater interest in the work and welfare of the Company. They knew very well they were now to a large extent working for themselves as well as for the other shareholders; and they had the pleasure of knowing there was no fear of dispute arising between them and the Company, seeing that they were now co-partners in the undertaking.

The resolution was agreed to.

Extraordinary Meeting.

The meeting was then made extraordinary, for the purpose of considering an amended scheme enabling employees holding ordinary stock of the Company to elect Directors, pursuant to the provisions of the South Suburban Gas Act, 1904.

THE EMPLOYEE-DIRECTOR SCHEME.

The CHAIRMAN moved that the amended scheme be approved, and that the Directors be authorized to proceed with it, subject to such additions, alterations, and variations as the Board of Trade may think fit to make therein and the Directors approve. He explained that in 1904 the shareholders passed a scheme for the election of Employee Directors. There were to be only two then. The Act stated that when the amount of stock held by the employees exceeded £10,000, the Board might present a scheme for the election of Employee Directors. It did exceed this sum in 1904; and the scheme was presented and adopted. These Directors were to be either one workman and one officer or, if the officers did not choose to select one of their number, two workmen. The officers did not act under the scheme; and two workmen were elected. Mr. Waller, a bricklayer, was the first; and he was immediately followed by Mr. Wyllie, a carpenter. He was sure that the two best men in the Company's service had been selected for the purpose. He was proud to be able to say this, because it had been contended that workmen could not be trusted to make a wise choice. Mr. Thomas Burt, the highly respected Secretary of the Northumberland Miners' Union, and a Member of Parliament, said that when this responsibility was cast upon them, the workers might be trusted to select men who would be a credit to them; and the Company's employees had done this. Not only had Mr. Waller and Mr. Wyllie been very useful on the Board; but they had taken a proper view of their duties. Before the South Metropolitan Company got their Act authorizing the election of Workmen Directors, knowing the late Mr. Mundella's sympathy with workmen, he went and told him what the Company wanted to do. Mr. Mundella said he would like to see the experiment tried. But he was a little afraid that the men, if elected by workmen, might take a narrow view of their duties, and consider it was their place to look specially after the workmen's interests; and if they did, they would make a mistake, because when a man was once elected on the Board he should consider all interests. He (the Chairman) was pleased to say—and his colleagues would bear him out—that Mr. Waller and Mr. Wyllie had taken the view that, as Directors, it was their duty to do their best for the Company as a whole—for the three interests of consumers, shareholders, and employees. The South Metropolitan Company had had Employee Directors for nine years—first two workmen, and then two workmen and a clerk—and they did just as well as the South Suburban Company. They selected the best men possible; and when they retired (year by year in turn) they were always re-appointed. The South Suburban scheme lapsed this year, it having only been arranged for three years. The reason for this was that some people said if the scheme did not succeed there would be a strike if they attempted to get rid of it; so the Company fixed it in such a way that it would lapse absolutely at the end of three years, and if it was a failure there would be no more to say about it, and no renewal. The South Metropolitan scheme was arranged in this way; and they re-enacted it for nine years. The three years of the South Suburban Company expired this year; and the Directors proposed the re-enactment of the scheme, for a much longer term. They proposed that the scheme "shall continue in force until 1950, or short of that year so long as the shareholders approve." He thought by 1950 the system would be proved either a success or a failure. In other respects, the scheme was mainly a repetition of the old one; but there was a little variation. For instance, they wanted to provide for the increasing holding on the part of the employees. They had now £20,000 in ordinary stock of the Company, whereas they had £10,000 when the scheme was started; and if the system was to be a success, their holding must go on increasing. Suppose in three or four years the employees' holding got up to £30,000, and that then a change should come over them and they should say they had no longer confidence in the Company, and should sell their stock, and the £30,000 should become reduced to (say) £25,000, were they still to have the same representation on the Board? Of course, the principle of this representation was that it should be a representation of property held by them in the Company. The scheme was not merely a partnership in profits, but it was a partnership in responsibility; and that might be a more important matter. Therefore the Directors made a provision that if at any time the aggregate investment of the employees should fall back by 10 per cent. of its amount below any figure it might have attained, one of the Employee Directors should retire, and the number should be reduced to two. If the reduction amounted to 20 per cent., the number should be reduced to one; and if a reduction of 30 per cent. took place, this should disqualify the remaining Director. These conditions did not apply when the aggregate holding of the employees exceeded a tenth part of the capital, or more than £60,000. This was to maintain the principle that the representation was a representation of property, based on confidence in the Company. Then there was another proviso, because it would be very awkward to saddle the Company with a thing of this kind absolutely, which, in the event of failure, might turn out rather disastrous. It was therefore provided that the scheme shall continue in force so long as, in the opinion of the shareholders, it answers its purpose of promoting a true union of employers and employed. If the employee shareholders should reduce their holding of stock below the 30 per cent. mentioned, the scheme should thereby become null and void, and incapable of revival, until the conditions under which the Employee Direotcrs were sitting were restored. Should this happen, the Directors, with the shareholders' consent and approval, might revive the scheme. In the event, in the opinion of the Directors, of the failure of the scheme to answer the above-named purpose, it could be terminated by a special general meeting of shareholders—the whole procedure and the termination of the scheme to be subject to the consent and approval of the Board of Trade. This was to provide for possibilities; the Board did not think they were probabilities. They regarded it as almost out of the range of probability that the thing could fail; but if Socialism should become the dominating principle animating the people of the nation, he supposed there would be an end to this scheme and most others. The fees of the Employee Directors would start at 21s. According to the Act, the fees should bear some proportion to the amount of the qualification—not being less than an ordinary day's pay nor more than four times that amount. As the aggregate holding of stock increased, the qualification of the Employee Director increased. With £20,000 of stock held, the qualification was £100; with £30,000, £120; with £50,000, £140; and with an aggregate holding of one-tenth of the total capital, the qualification was £150. No man was eligible for an Employee Director unless he had been continuously for fourteen years in the employ of the Company, and he had held for not less than twelve months prior to the date of election, and continued to hold, not less than £100 in the stock of the Company. He thought

they had inserted all safeguards, and that the shareholders might be content to pass the scheme. It was a great experiment; and they might take credit for trying to do something for the good of the nation, and something which, if it were adopted generally by joint-stock companies, would, he believed, lead to a much more satisfactory position as regarded Capital and Labour. It had been left to these two or three Gas Companies to show the way. The shareholders of the South Suburban Company had always been perfectly willing to help in this matter, and he hoped they would be so still.

The DEPUTY-CHAIRMAN seconded the resolution; and it was carried unanimously.

On the proposition of Mr. BORASTON, seconded by Mr. G. READ CLARKE, a vote of thanks was passed to the Board and officials.

Of this, acknowledgment was made by the CHAIRMAN, Mr. S. Y. SHOUBRIDGE, the Engineer, and Mr. CHAS. M. OHREN, the Secretary. Mr. Shoubridge remarked that he thought he could promise that the results of the present half year would be equal to, if not better than, those of the past.

CROYDON GAS COMPANY.

Flourishing Business—Works Changes and Improvements—The Coal Market.

The Half-Yearly Meeting of this Company was held on Friday, at the Offices, Katharine Street, Croydon—Mr. CHARLES HUSSEY, J.P., in the chair.

The SECRETARY (Mr. W. W. Topley) read the notice calling the meeting, and it was agreed to take as read the Directors' report and the accounts.

The CHAIRMAN, in moving their adoption, said the statement of accounts which he had the pleasure to submit was one which would, he thought, be gratifying to the proprietors. In all directions, it bore evidence of a growth in the undertaking which was steady and continuous, though not sensational, but perhaps the more satisfactory on that account. It would have been noticed that the increase in the sales of gas amounted to 8·27 per cent. on that of a year ago. This represented in quantity an increase of more than 44 million cubic feet, and in value nearly £6000. Residuals had also yielded an increase of £3300; making a total increase on the credit side of the revenue account of nearly £10,000. The raw materials—coal and oil—had cost £7000 more; and the difference of about £3000 was more than represented by increased gross profit; this being £3400 more than a year ago. From the profits thus at their disposal, the Directors had placed a further £1000 to the renewal fund; and they proposed to carry forward, after the payment of dividends, a balance of £7487, or £3000 more than last half year. It would be seen from the report that the increase in the number of consumers was 929; bringing the total to just over 30,000. The stoves on hire continued to increase, not only in number, but in proportion to the number of consumers. He had in past half years pointed out that the Company did not supply stoves as part of prepayment installations without charging a specific rent for their use; and so they were entitled to assume that every stove out on hire was required, and was used, by the consumer hiring it. After a brief reference to the lecture delivered at the new offices and show-rooms, by Professor Vivian B. Lewes on May 29 (as reported in the "JOURNAL" at the time), the Chairman said, in connection with the show-rooms—of which the Company now had four to meet the convenience of consumers in their widely scattered district—that the proprietors might not be aware that the authorized area of supply now covered some 70 square miles. The Directors had arranged that on four days in each week the show-rooms should remain open till seven o'clock in the evening. This would, they hoped, meet the convenience of that large section of the consumers whose business engagements prevented them from reaching the offices by the usual closing hour. There had now been a full half-year's experience of the working of the large range of new stove-repairing shops at the works, and the Directors had every reason to be satisfied with the result. The Company had gained greatly in the quality of the work turned out there, and in the promptness with which it was executed. It was also found that they could effect very considerable savings as compared with the cost of working under the former less advantageous conditions. As most of the proprietors were probably aware, the Company had, since the acquisition in 1905 of the Caterham Company's undertaking, carried on the manufacture of gas at that Company's comparatively small works at Whyteleafe, as well as at Waddon. It was from the first intended that as soon as possible, all the manufacture should be carried on at the Waddon works, and a saving be thus effected from the more economical methods possible there. The margin of manufacturing plant at Waddon over the Croydon needs had, however, until now been so narrow that the Directors had not felt justified in throwing on the Waddon works the extra burden. But as the new section of scrubbing, washing, and purifying plant at Waddon could be brought into use for the coming winter, it had now become possible to close the Whyteleafe works; and they were accordingly closed last April. They might look for some saving from this step; and the Board had hopes of letting such portion of the old works as they did not need for distribution purposes, and of obtaining a small further revenue from this source. Regarding the reference to the new section of scrubbing, washing, and purifying plant at Waddon, at the last two or three half-yearly meetings, he had told the proprietors of the steps the Board had been taking in this direction. This portion of the old plant was practically the same as that of thirty years ago, when only one-fifth of the present output of coal gas had to be dealt with; and it was not only becoming inadequate to the work it had to do, but was of an old type. He need hardly point out to those of the proprietors who kept in touch with the trend of gas engineering that great—he might almost say revolutionary—changes and improvements had come about of late years. The plant their Engineer had just completed embodied the latest and most improved methods. It had just been tested with satisfactory results, and was now coming into use; and they looked to it to effect improvements in their working results. There was much now at the works worth seeing by anyone taking an intelligent interest in modern processes of gas manufacture; and the Directors hoped, at a comparatively early date, to invite the proprietors to visit the works, and inspect their property, of which he ventured to assert they would feel as proud as did the Directors. It would have been seen from the report that the price of gas in the district supplied up to 1894 by the Carshalton Gas Company was now, by reason of an arrangement embodied in the Croydon Company's Act of 1904, reduced to the price in Croydon—at the present time, 2s. 8d. per 1000 cubic feet. The result of this reduction in the price of gas in Carshalton was that the holders of the "Carshalton" capital—that was to say of the "C" stock—would from this half year receive a dividend at the same rate as that upon the "B" stock. Their dividend would rise from 10¾ to 11½ per cent. per annum. It might be of interest if he mentioned that, as a result of the amalgamation of 1894, the Carshalton consumers, who were formerly paying 4s. 6d. for gas, and receiving a dividend of 8 per cent., would now pay 2s. 8d., and receive a dividend of 11½ per cent. So far, he had dealt chiefly with the past. As to the future, the two topics of most absorbing interest from the point of view of gas administration were, of course, the price of coal and the price of gas. The contracts for coal for the year to June next were now made; and an increase in cost, due to the higher prices, would have to be faced of some £12,000 in the coming year. Gas companies could generally look for an improvement in the yield from some of their residuals as a partial set-off against increases of this kind. It must be borne in mind, however, that, while during this past year they had been getting coal at prices based on those ruling in the early part of 1906 (when their last year's contracts were made), they had during last winter been getting for coke the high prices due to the general advance in fuel. It would not therefore be wise to be too sanguine in their anticipations as to residuals, though they might, he thought, look for some little advantage in this direction. Perhaps they might venture to estimate the increased net cost of raw material during the whole of the coming year at about 2d. per 1000 cubic feet of gas made. They had over and above this to provide for the charges on revenue which would have to be met in respect of the alterations and improvements of the old retort-houses, on which work a commencement had been made; and they would further have to face the loss of revenue from the reduction of price in Carshalton and the increased dividend on the Carshalton capital. These last two items represented about £2700 per annum. In large measure, the sum they were about to spend on alterations would result in an improved capital value, and to that extent they might rightly charge them to capital. But sound finance required that such part of their coming expenditure as represented renewals should be borne by revenue. As he had said, the renewal fund (which they had been forming since their Act of 1904, and which now amounted to £5167) was available, and had been, in fact, created for this purpose. But it was not at present sufficient to fully meet these charges; and they had to be met in some way. The four items of expense named—dear coal, and heavy renewal charges, with the reduction in price and increased dividend on the Carshalton capital—falling together, caused the Directors some apprehension as to whether some small increase in the price of gas might not shortly become necessary. He could only say at this stage that it would be with the greatest possible reluctance that the Directors would adopt such a measure, and that, in the event of an advance being found to be unavoidable, every effort would be made to reduce the price again at the earliest possible date. At the time of the last coal boom (in 1900), the Directors refrained from advancing the price of gas till long after it had in most other districts gone up from 3d. to 7d. per 1000 cubic feet; and the small advance which they did at last make was continued for only a short time. It would be their endeavour to maintain now a similarly good position for the Company.

The DEPUTY-CHAIRMAN (Mr. Thomas Rigby) seconded the motion, which, after two or three inquiries regarding the accounts had been answered, was unanimously agreed to.

Mr. CORBET WOODALL proposed the declaration of a dividend at the rates per annum of 14½ per cent. on the "A" stock, 11½ per cent. on the "B" stock, 10¾ per cent. on the "C" stock, 5 per cent. on the "D" capital, and 10 per cent. on the "E" capital—all less income-tax. It was, he said, a great pleasure to propose a dividend so satisfactory as they were doing that day. This was a time of abounding prosperity in the country; and yet one heard all round moans from the managements of industrial undertakings about falling values and reducing profits. Many of the industries were essential to the comfort, if not to the life, of the nation; and yet they felt the stress of competition and all other circumstances tending to the reduction of value more keenly than the gas industry (which was sometimes spoken of as a "decaying industry") had done. The number of applications open to gas, and the great number and variation of the products obtained in the distillation of coal, were such that they usually found when one was depressed some other was in good trim or booming; and so the even tenour of their way was little disturbed. The Chairman had referred to the extraordinary circumstances under which gas undertakings were passing just now, with the vast increase in the price of coal. Coal had cost them a higher price during the past half year than in the corresponding half of 1906. It would cost them a very much larger sum in the year upon which they had just entered; but they had heard the Chairman's hope, and he (Mr. Woodall) might express his own confident expectation, that they would "worry through" the year without any necessity for an increase in the price of gas. Consequently those of their neighbours and friends who were users of gas-fires and gas for other purposes would feel no inconvenience from the great increase which the Company would have to meet in the price of coal. With regard to the works themselves, as the proprietors knew, a very large sum of money had been spent upon them—evidenced by the steadily increasing amount of the capital expenditure; but they had works which were steadily increasing in their economic efficiency, and of which, he felt sure, the proprietors would be proud when they visited them, and which they knew would do all that good works under the direction of a good Engineer could accomplish for them. He (Mr. Woodall) looked forward with as much cheerfulness to the future, and with as much confidence, as he had done in the past.

Mr. WILLIAM CASH, in seconding the motion, remarked that, after paying the dividend, there would be the satisfactory balance of £7487 to be carried forward.

The motion was unanimously carried.

The usual votes of thanks were passed to the Chairman and Directors, to the General Manager and Engineer (Mr. J. W. Helps), the Secretary (Mr. W. W. Topley), the Assistant Engineer (Mr. A. C. Caddick), the Distribution Superintendent (Mr. W. J. Sandeman), the staff, and the workmen. The remarks of proposers and seconders were most appreciative, and the proprietors' endorsement equally cordial.

TOTTENHAM AND EDMONTON GAS COMPANY.

The Annual General Meeting of the Company was held last Saturday, at the Works, Willoughby Lane, Tottenham—Mr. CORBET WOODALL in the chair.

The SECRETARY (Mr. E. Topley) read the notice calling the meeting; and it was agreed to take as read the Directors' report and the accounts for the half year to June 30.

The CHAIRMAN, in moving the adoption of the report and accounts, said it was his pleasant duty once more to submit a good report on the affairs of the Company. If, at the conclusion of the meeting, the proprietors would walk round the works, they would, he was sure, see evidence that the year since they last met there had not been an idle one. With one slight exception, all the extensions which were in hand a year ago were now completed, and paid for. The Company would now have a respite from new construction; but if increases of 10 per cent. per annum were still in store for them, the respite would be but a short one. The new plant had not only enabled them to meet the necessities of the consumers, but it had proved economical in working, and had enabled them, in face of the trying circumstance of a heavy additional cost for materials, to reduce the price of gas.

CAPITAL AND CONSUMPTION INCREASES—REDUCTION OF CAPITAL PER MILLION CUBIC FEET.

A visit to the works naturally suggested retrospect; and he had had prepared a few figures illustrating the progress of the Company during the last four decades. He found that in 1866 the total capital employed was £56,146; by 1876, it had increased to £75,000, or 33·6 per cent. in the decade. In the same period, the quantity of gas delivered increased by 142 per cent. In the following decade, the capital advanced to £147,819, or 98 per cent.; while the increase in the quantity of gas distributed was 131 per cent. By 1896, the capital was £239,457, or an increase in the decade of 62 per cent.; and the increase in the quantity of gas delivered was 70·3 per cent. By June last, the capital was £563,249, or an increase in the decade of 135 per cent.; while the increased quantity of gas sent out was 214 per cent. The effect of this was shown in the proportion of capital employed per million cubic feet of gas sold. In 1866, £1377 was employed for the manufacture and distribution of each million cubic feet of gas. In 1876, the £1377 had fallen to £759; after the lapse of another ten years, it was £646; in the following ten years, it fell to £614; and at the present time, it was £461 per million. The effect of this was seen in the amount of money required to pay the dividend and interest. In 1866, for every 1000 cubic feet of gas sold, to pay the dividend and interest 2s. 0·44d. was required; the dividend at that time being 9 per cent., and the interest 5 per cent. He would not trouble the proprietors with the figures for the intervening period; but to-day they paid the dividend on the stock and the interest on the borrowed money with 6·39d.—less than 6¼d., against 2s. 0·44d. in 1866. This was not because there had been a reduction in the amount of the dividend, inasmuch as in 1866 the dividend was 9 per cent. and the interest 5 per cent., and now the dividend was 13¾ per cent. and 10¾ per cent. (interest being 4 per cent.)—that was to say, the dividend after allowing for the conversion of the stock, which took place a few years ago. He thought these figures were not only striking, but remarkably satisfactory. It had been a period of unbroken advance in the direction of reducing the cost of manufacture, and vastly increasing the amount of gas sold, and at the same time increasing the dividends of the proprietors. The increase of the dividends had always been accompanied by a reduction in price. In 1866, the price of gas was 5s. per 1000 cubic feet; in 1876, 4s. 3d.; in 1886, 3s. 4d.; in 1896, 3s.; and in 1907, 2s. 6d. So that, taking the figures as one would, they showed progress in the direction that the Directors, and he was quite sure the proprietors, desired that progress should be made. And he might say that he saw nothing whatever in the outlook to cause fear that the rate of progress in the right direction would not be continued. It was true they were now faced with competition. The public supply of electricity was introduced into Edmonton about three months ago. He had said before at their meetings that, in his opinion, there was room for both services, and that they could, without disloyalty to gas, wish prosperity to the younger aspirant for favour. In the Company's area especially, gas with its many useful applications was more essential than electricity; and they were accordingly the stronger. The Company would not, however, part with any fraction of their supply till they had exhausted all means to retain it.

PROGRESS OF THE TOTTENHAM AND EDMONTON GAS COMPANY.

Table from which the Chairman, Mr. Corbet Woodall, quoted at the Meeting of the Company last Saturday.

Year.	Capital Employed.				Gas Sold.		Revenue.		Price per 1000.	Dividend and Interest Paid.	Per 1000 Sold.
	Total. £	Increase. £	Per Million. £	Decrease. Per Cent.	Thousands.	Increase.	Total. £	Increase. £	s. d.	Per Cent.	s. d.
1866 . .	56,146	—	1377	—	40,760	—	12,465	—	5 0	Div. 9 } Int. 5 }	2 0·44
1876 . .	75,000	18,854 or 33·6 %	759	81·4	98,802	58,042 or 142 %	28,379	15,914 or 128 %	4 3	Div. 10 } Int. 5 }	1 4·38
1886 . .	147,819	72,819 or 98 %	646	17·5	228,658	129,856 or 131 %	47,843	19,464 or 61 %	3 4	Div. "A" 11, "B" 8 } Int. 4 }	1 0·53
1896 . .	239,457	91,638 or 62 %	614	5·2	389,523	160,865 or 70·3 %	67,232	19,389 or 40 %	3 0	Div. "A" 11½, "B" 8½ } Int. 4 }	d. 10·69
									2 8 and 2 6	After Conversion.	
June, 1907	563,249	323,792 or 135 %	461	33·2	1,220,560	831,037 or 214 %	209,362	142,130 or 211 %		Div. "A" 6⅝, "B" 5¼ } Int. 4 }	d. 6·39

A REVIEW OF THE HALF YEAR'S ACCOUNTS.

Turning now to the accounts. The working results of the half year had been very good. They had sold more than 11,000 cubic feet of gas per ton of coal, or oil equivalent to 1 ton of coal, used. Materials had cost £3000 more; but the gas sold was worth £7500 at last year's price, and the reduction in charge gave back over £5000 of this to the consumers. The increased quantity of gas made had involved no addition to the wages bill. The receipts for products were £5300 more, due partly to the larger quantity of coal used, and partly to the circumstance that they were reaping advantage from the higher price of coke, while still purchasing coal at the rates of last year. The result of the trading was that, after paying all charges for interest, they had a balance £2000 in excess of what was needed for dividend at last year's rate. This being so, the Directors recommended the payment of ¼ per cent. per annum more on each stock, which was the amount to which the proprietors were entitled by reason of the reduction in the price of gas. This would absorb £648. Further, the Directors had written down the value of Consols, in which the reserve and insurance fund were partly invested, to 85 per cent. at a cost of £963. They had also paid £1245 for stamp duty on the new capital created, and £469 for redemption of tithe and land tax on the new land purchased. These sums together amounted to £3467, and reduced the balance carried forward by £1510. The reserves amounted to £50,000.

THE COAL AND COKE SITUATION.

The Directors had made contracts for coal to July next at an average increase per ton of 2s. 6d. This meant a total sum of £10,000 for the twelve months. They were selling coke at an enhanced price; so that a large portion of the £10,000 would be a clear inroad upon profits, and must be provided for as best they could. One thing was quite certain, they would not meet the deficiency by increasing the charge for gas. The consumers might rest assured that, unless the very much unexpected happened, the tendency of the price of gas would be downward rather than upward. The experience of the past half year had deepened the regret he had expressed at the removal of the duty upon exported coal. It was possible that the duty, if continued, might not, under the peculiar circumstances of the time, have materially reduced the quantity exported, but they would have had the satisfaction of seeing the exchequer benefited, and the occasion for heavy taxes reduced as some compensation for the great inroads upon our national reserve of power. If coal continued at the present heavy cost, it would, of course, impose great hardships on the poor, both directly by adding to the cost of domestic fuel and indirectly by crippling the industries which provided employment. Though the Directors would not increase the cost of gas, neither would they be able to reduce it, and their charge for coke would be heavier.

CARBURETTED WATER GAS.

The oil-gas plant was in good order, and was being used freely, so as to keep down the quantity of coal carbonized. There was some difficulty at first in disposing of the tar made under this process. But its value had now been established; and they were receiving a larger price for it than for the tar from coal.

GOOD PROSPECTS.

The longer he was associated with the gas industry, the more impressed was he with the broadness of the foundation on which it was based, and the area of the field yet to be cultivated. One development showed the way to another; and whether in the processes of manufacture, or in the application of the gas when made, they had by no means exhausted the possibilities before the industry. Most shareholders who had held gas stock steadily were to be congratulated. It had been a good investment in the past; and, in his opinion, never stood better than at the present time. Holding these views, he had no hesitation, but great pleasure, in moving the adoption of the report and statement of accounts.

Mr. HENRY BAILEY seconded the motion, which was unanimously adopted.

THE INCREASE IN DIVIDEND.

The DEPUTY-CHAIRMAN (Mr. D. Ford Goddard, M.P.), moved the declaration of dividends at the rates per annum of 6¾ per cent. on the "A" stock and 5¼ per cent. on the "B" stock. In the course of his

remarks, he said that, arising from a misconception of the facts, there were certain people who seemed to think that those who took dividends from industrial concerns were all rich people, of the class of millionaires. As a matter of fact, the people who took dividends out of gas companies were not of that community at all, but they were people who were thrifty, and who had taken care of their earnings and savings, and who put them by in what they considered to be good sound industrial undertakings. These people had every right to the profits which the undertakings realized in which they invested their money. The resolution he had to move on this occasion was an additionally pleasant one, because it suggested the payment of an extra ½ per cent. The profit had been fairly earned. And he should like to point this out: That for every £1 the proprietors received by way of profit in addition to the standard rate of dividend, they had to give to the consumers £8. That was the proportion that existed—1 to 8. The figures the Chairman had given them that day as to the progress of the Company were most amazing; and should be studiously considered. They meant a tremendous deal. In face of a strong competition like the electric light, they were holding their own and improving their position; and the striking facts showed the wonderful character of the district. The district was what he might call the dumping-ground for the excess population of the congested areas of the great Metropolis; and the Company were reaping the benefit.

Mr. G. T. Watson seconded the motion; and it was unanimously agreed to.

Moved by the Chairman, and seconded by Mr. W. B. Randall, Mr. Henry Bailey was re-elected a Director; and on the proposition of the Chairman, seconded by Mr. J. L. Chapman, Mr. Watson was also returned to his seat at the Board.

Mr. J. Eve proposed, and Mr. E. Sawyer seconded, the reappointment of Mr. Edward Crowne as one of the Auditors; and the proposition was passed.

Dr. Scott moved, and Mr. J. Grounds seconded, a vote of thanks to the Chairman and Directors for the valuable services they had rendered to the Company.

The Chairman responded, and then moved a vote of thanks to the officers, staff, and workmen of the Company; remarking upon the interest in, and devotion to, the work exhibited by one and all.

Testimony as to the Value of Technical Directors.

Mr. A. E. Broadberry thanked the Chairman, Directors, and proprietors, on behalf of himself, his staff, and the workmen, for the vote. Naturally, he remarked, with all the work that had been going on, they had had a great deal to do; but they enjoyed doing it. The quantity of work that had been proceeding could be imagined by the proprietors as they inspected the buildings and plant. This had not been done at the expense of a high price for gas, because, as the Chairman had shown, the charge for gas was very low for an outside London area; it had not been done at the expense of the proprietors, because they were receiving larger dividends than they had ever had before; and the capital account had been very materially reduced per million cubic feet of gas sold until it had reached a very low figure. At previous meetings, this work had been referred to; and his staff and himself had had a great deal of praise for it. But there was one thing he should like to place on record. He had done it at technical meetings; but he should like to do it also at this one. It was this, that these beneficial results, in his opinion, had been brought about more by the fact that the Company had a highly Technical Board than by anything else. They had a Chairman who was an eminent engineer; they had a Deputy-Chairman, who was also a gas engineer by profession, and had done a great deal of service for the gas industry; and the last addition to the Board—Mr. James Randall—was almost a gas engineer from his long experience in the gas industry. It could be readily imagined that, with such a Board as this, all the officers had to keep themselves absolutely up to "concert-pitch" in their knowledge as to what was proceeding in the gas industry; and they had to have very good reason for the faith that was in them when they brought any recommendation before the Board, because any flaws would at once be seen, and the recommendations would not be accepted. But there was something beyond that. Although some gas engineers did not like a technical board, he could assure them that such technical engineers as they had on the Tottenham Board were a great help in carrying out the work. When he had brought proposals before the Board, the technical assistance and encouragement he had had from Mr. Woodall and Mr. Goddard had enabled him to make the works what they were. The works, he said emphatically, could not have been what they were but for the fact of the Technical Board. When the proprietors went round the works, they would realize that they were second to none in the country in efficiency and cleanliness. So long as they were allowed to continue, it would be the aim of all connected with the work of the Company to keep gas the leading illuminant of the day.

Mr. Topley also briefly responded; and the proceedings terminated.

The proprietors afterwards inspected the works, under the guidance of the Engineer and his assistant (Mr. J. Terrace); the Chairman and Directors also accompanying.

WEST HAM GAS COMPANY.

Development of Business and Capital Requirements—The Coal Market and the Price of Gas.

The Half-Yearly General Meeting of the Company was held last Wednesday, at the Liverpool Street Hotel, E.C.—Mr. J. Lister Godlee in the chair.

The Secretary (Mr. A. G. Snelgrove) read the notice calling the meeting; and the Directors' report and the statement of accounts were taken as read.

The Chairman, in moving the adoption of the report and accounts, said, in considering the latter, the shareholders would bear in mind that throughout the half year the price charged for gas had been 1d. per 1000 cubic feet less than in the corresponding half of 1906. But for this, the sum received for gas would have been £3476 higher than it was. Regarding the increase of more than £3000 in rates and taxes, the Directors had been discussing for about three years a proposal to raise the Company's assessment, which appeared to them to be excessive. They had arrived at last at a settlement, which their advisers had recommended them to agree to; but the reduction of the proposed assessment was not so great as the Board had hoped. They had no doubt been a little too sanguine; and while making provision in their accounts from time to time to meet some increase in the assessment, they had not made enough; and the balance had to be paid out of this half year's income. The amount of the item therefore appeared abnormally large; but, as a matter of fact, the rate in the pound this year was somewhat less than it was last year. Notwithstanding these large figures, the half-year's results were eminently satisfactory. There had been a small further decrease in the carbonizing wages, while the total charges for manufacture were nearly 1d. per 1000 cubic feet less than last year. The distribution charges showed an increase per 1000 cubic feet of gas sold, which was to be accounted for by the continued rapid increase in the consumers using slot meters, and to the amount the Directors continued to write off for the depreciation of the meters and fittings. In the result, the net profit for the half year was just ¾d. per 1000 cubic feet sold less than in 1906, while the price of gas had been 1d. less. The fixed capital had come down from 12s. 5d. at the end of the year 1906 to 12s. 1d. per 1000 cubic feet of gas. The quantity of gas made during the half year (860 million cubic feet) was nearly 94 million cubic feet more than in the first half of 1906—an increase of 12·25 per cent.; while the quantity sold was 834 million cubic feet, or an increase of 12·8 per cent. Up to the present time, in the current half year, they were making a still greater increase over the corresponding months of 1906. If this rate of increase were maintained, it meant that they would have to make provision for the manufacture of an additional 240 million cubic feet per annum. This would go far to explain the necessity for the extraordinary meeting which was to follow this one. As he believed he told the shareholders in February, the running coal contracts, most of them made two years ago, had saved the Company from being seriously affected by the startling rise in the price of coal, and they had not seen any reason up to now to announce an increase in the price of gas. But he was not at all prepared to say that they might not be obliged to do so before long. They had made fresh contracts on terms that, under the circumstances, the Board thought satisfactory; but the increased cost of coal during the next twelve months would be about £16,000. Of course, the Directors anticipated that this sum would be to some extent provided for by additional income from residual products; but it was impossible at the present time to say how much this would be. It was, however, a very large amount for the Company to have to meet out of profits; and although they would have £19,600 of undivided profits standing to the net revenue account, after paying the dividend and making the addition to the reserve fund which the Board recommended, yet, unless they saw a prospect before long of a material reduction in the price of coal (and they had no good reason to expect it in the immediate future), he was afraid they would have to take the same course as many of their neighbours had been obliged to adopt. It would have been noticed in the report that the Directors suggested that the same dividend should be paid on the ordinary stock as was declared last year, and that the additional 1s. 3d. per cent.—viz., £528—which the reduced price of gas enabled them to dispose of should be carried to the reserve fund. This proposal was in accordance with suggestions he had more than once made at the meetings, that the time was coming when they ought to increase the fund, which now amounted to £13,222. The Directors considered it was very advisable that the fund, which had been found of great use not so very long ago, should be enlarged more rapidly than by the automatic increase coming from investing the dividends received from the India Stock in which the fund was placed. He hoped the proprietors would agree in thinking that it was wise to strengthen the Company's position in this way. The present was, as it seemed to him, a very suitable occasion for doing this. It was more satisfactory to pay a steady dividend than to make a small increase in it, and then in a very short time perhaps to be compelled to reduce it again. The remarks he had made to the shareholders had some weight in this matter. If they paid the same dividend of £5 2s. 6d. now, they would not be under the necessity of making any alteration in it in the event of their being obliged to raise the price of gas, unless it was found essential to add more than 1d. per 1000 cubic feet to the price. The shareholders would allow him to add a few words at once on the proposals to be brought before them at the extraordinary meeting, so that he might deal with the whole position of the Company in one speech. It would be seen that the balance on capital account at the end of the past half year was £28,610; while during the half year their expenditure properly chargeable to capital, after deducting the large depreciation charged to revenue, amounted to more than £40,000. He had already stated that the business went on expanding very rapidly. This was especially marked in the slot-meter business, which showed no signs yet of falling off; and it was, in fact, impossible to meet the demands made upon the Company, except by capital expenditure. He did not know that this expenditure would be quite so heavy during the present half year; but it would be very considerable, and it was quite certain they would soon want more money than the amount standing to their credit on this account. The shareholders would not wish the Directors to be continually coming for fresh authority to issue capital; and they had always been willing to entrust them with large powers, leaving the time of exercising them to the discretion of the Board. He did not at present think they would raise any additional capital before the end of the year; but it would probably be necessary to begin negotiations before the shareholders met again. The Directors therefore asked them to create a further sum of £75,000 partly of preference and partly of consolidated stock, and £35,000 of debenture stock. The possession of this power was an assistance in case the Board required some help from their bankers; but they would not issue more of any of these stocks than they thought the occasion demanded. If the shareholders adopted the resolution which would be submitted at the extraordinary meeting, the power of creating capital given in the Company's last Act of Parliament

would be limited to a further sum of about £59,000 in preference and ordinary stock, and a sum of £46,700 in debentures. It would no doubt occur to shareholders that this meant that the Company would be obliged to be in Parliament again in the session of 1909 or 1910—probably the former. That was only seven or eight years after their last Bill, which their opponents suggested provided them with enough money for twenty years. He hoped the suggestion of the Directors would be approved. It would be seen in the report that the Bill which had been promoted by the Company and several others for relieving them from certain statutory restrictions on account of sulphur compounds in gas had been passed; it was, in fact, unopposed in all its stages. They were by this Act placed in the same position in this respect as their larger neighbours. The parliamentary costs falling upon the Company for the Act only came to some £192. He wished they could do parliamentary work as cheaply as this on all occasions. In conclusion, he said the Company were still in a very prosperous condition, and that if there was one black rock looming ahead, they did not think there was any risk of their being shipwrecked upon it, or suffering any disaster therefrom. The results of the working were the best evidence that the shareholders were still well served by their excellent staff, many of whom were now old servants.

Mr. T. S. GEERE seconded the motion, remarking that he hoped the shareholders would be well satisfied. The Company were making great strides; and these were being maintained.

Mr. CLEVERLY remarked that it might be a little ungracious to ask any questions after the excellent exposition they had had as to the Company's finance. There were, however, two or three little points upon which he should like information. With regard to depreciation, had there been sufficient put by under this head? As to the sulphur compounds question, were the Directors quite satisfied as to this matter? He (Mr. Cleverly) did not say it was wrong, but he had a little nervousness as to whether the sulphur would not be rather a drawback to them some of these days. Respecting the investment of the reserve fund, India Stock had depreciated; and he should like to know whether sufficient had been written off for that. As to the slot-meter installations, he took it a large portion of the capital required would be used for the purposes of slot installations. Could the Chairman give them the average price of the installations during the past half year? It seemed to be quite unnecessary, or it ought to be quite unnecessary, to impress upon the Directors that this was a time to be very economical in the expenditure of capital.

The CHAIRMAN, in reply, said he thought the Directors were putting by enough for depreciation. The only question that had occurred to some of them was as to whether for some parts of their works they were not writing off rather too much. But it was the most wholesome thing they could do to write off somewhat severely for depreciation; and he did not think they were doing too little. He was quite satisfied with having obtained the power, by their new Act of Parliament, to leave the sulphur compounds other than sulphuretted hydrogen in the gas. It did not oblige them to leave in too much sulphur. They were not compelled to sell bad gas because they could do it without being caught; and the shareholders might leave the Directors and their officials to look after this. As to the writing-down of India Stock, it would be hopeless to keep writing it up and down; and such a course would not help them in any way. As to the cost of the slot installations, at the present time it ran out at about £7 each.

On the proposition of the CHAIRMAN, seconded by Mr. H. C. PELLY, a dividend was declared at the rate per annum of 5 per cent. on the preference stock and £5 2s. 6d. per cent. on the consolidated ordinary stock.

Extraordinary Meeting.

An Extraordinary Meeting was then held, at which the CHAIRMAN moved a resolution, authorizing the Board to create and raise as required £25,000 of preference stock, £50,000 of consolidated ordinary stock, and £35,000 4 per cent. perpetual debenture stock. In his remarks, the Chairman gave a *résumé* of the statement he made in his opening speech.

The resolution was seconded by Mr. FRED. NICHOLSON; and carried unanimously.

On the proposition of Mr. WIGLEY, seconded by the Rev. T. TEED-HEAVER, the services of the Board were heartily acknowledged; and, in his response, the CHAIRMAN made generous allusion to the work of the chief officials, their staffs, and the employees.

COMMERCIAL GAS COMPANY.

The Half-Yearly Report and Accounts.

The following is the report the Directors of the Company will present at the half-yearly meeting on Thursday.

The revenue account shows a net profit for the half year of £61,806 11s. 10d., which, added to the balance of £22,947 5s. 8d. brought forward from last year, produces a net revenue balance of £84,753 17s. 6d. Deducting therefrom £9725 2s. 6d. for interest, there remains standing to the credit of the net revenue account a balance of £75,028 15s. available for dividend. The Directors recommend the payment of dividends thereout at the rates of £5 4s. per cent. per annum upon the 4 per cent. stock of the Company, and of £5 per cent. per annum upon the 3½ per cent. stock, both less income-tax. The balance of the net revenue will be carried forward to the next half year. The Directors announce with much regret the death of their esteemed colleague Mr. Thomas Bevan, who was for eighteen years a Director of the Company.

The accounts accompanying the report consist of the usual statements. They show that the paid-up stock on the 30th of June amounted to £937,605; that £1,076,875 had been added by conversion, making £2,014,480; and that £210,776 remained unissued out of the total authorized (including premiums) of £2,235,000. The total amount borrowed on the above-named date was £339,062 10s., and £135,937 10s. was added by conversion; making a total of £475,000, and leaving £79,226 to be borrowed out of the £550,000 authorized. The receipts on capital account amount, with premiums, to £2,544,586 16s. 5d. The expenditure stands at £1,396,884 3s. 9d., with a nominal amount of £1,212,812 10s. added by conversion—together, £2,609,696 13s. 9d. There is consequently a balance of £65,109 17s. 4d. carried to the balance-sheet. The expenditure on capital account in the half year was £11,639, apportioned as follows: New and additional mains, services, &c., £2726; stoves, £3252; prepayment meters and fittings (less £6944 written off for depreciation), £5661. The reserve fund amounted to £34,134; and the insurance fund to £32,647. The following is the revenue account:—

Expenditure.

Manufacture of gas—			
Coal and oil, including dues, carriage, unloading, and trimming	£96,227 5 2		
Salaries of Engineer and officers at works	2,398 19 8		
Wages (carbonizing)	18,369 15 6		
Purification, including labour	1,682 13 3		
Repair and maintenance of works and plant, materials and labour, less £60 1s. 2d. received for old materials	22,501 14 7		
		£141,180 8 2	
Profit sharing		2,695 8 8	
Distribution of gas—			
Salaries and wages of officers and rental clerks	£3,902 19 7		
Repair, maintenance, and renewal of mains and services, material and labour	8,363 14 2		
Repair and renewal of meters	2,621 3 2		
" " " " stoves	6,865 14 10		
" " " " prepayment meters and fittings	8,446 11 5		
Incandescent mantle maintenance, &c.	499 11 4		
		30,099 14 6	
Public lamps—lighting and repairing		2,514 12 4	
Rent, rates, and taxes		12,601 15 8	
Management—			
Directors' allowance	£1,250 0 0		
Company's Auditors	75 0 0		
Salaries of Secretary, Accountant, and clerks	1,222 4 6		
Collectors' salaries and commission	1,725 18 5		
Prepayment meter collection	2,203 3 9		
Stationery and printing	1,120 16 2		
General charges	1,910 3 11		
		9,507 6 9	
Bad debts		1,027 15 6	
Law and parliamentary charges		186 5 5	
Superannuations and allowances		1,259 12 10	
Official officers, &c.		101 15 10	
Total expenditure		£201,375 15 8	
Balance carried to net revenue account		61,806 11 10	
		£263,182 7 6	

Receipts.

Sale of gas—			
Common gas per meter at 2s. 5d. per 1000 cubic feet (83,254)	£185,410 6 1		
Public lighting and under contracts, common gas	5,886 11 6		
	£191,296 17 7		
Less discounts and allowances	4,050 5 8		
		£187,246 11 11	
Rental—			
Meters (24,060)	£2,883 14 6		
Stoves (48,044)	7,632 18 10		
Prepayment meters (58,418)	10,255 9 5		
Incandescent mantle maintenance	482 5 5		
		21,254 8 2	
Residual products—			
Coke, less £4455 19s. 2d. for labour	£32,542 1 5		
Breeze, less £536 14s. 8d. for labour	4,173 15 0		
Tar	7,125 0 9		
Ammoniacal liquor and sulphate of ammonia	10,757 8 3		
		54,598 5 5	
Miscellaneous receipts—			
Rent receivable	£53 12 0		
Transfer fees	29 10 0		
		83 2 0	
Total receipts		£263,182 7 6	

The following are the statements relating to the manufacturing operations of the Company in the half year:—

Statement of Coals and Oil.

Description.	In Store Dec. 31, 1906.	Received During Half Year.	Carbonized During Half Year.	Used and Sold During Half Year.	In Store June 30, 1907.
	Tons.	Tons. cwt.	Tons. cwt.	Tons.	Tons.
Common	21,998	102,265 13	105,435 13	847	17,981
Cannel	2,288	..	1,146 0	..	1,142
Total	24,286	102,265 13	106,581 13	847	19,123
Oil—gallons	312,133	1,253,339	1,206,567	..	358,905

Statement of Residual Products.

Description.	In Store Dec. 31, 1906.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store June 30, 1907.
Coke—tons	3,881	65,281	17,907	48,756	2,498
Breeze—tons	655	18,677	..	17,402	1,930
Tar—gallons	679,011	1,242,464	..	1,425,053	496,422
Ammoniacal liquor—butts	8,823	35,503	35,920	..	8,406
Sulphate of ammonia—tons	47	1,141	..	1,038	150

Statement of Gas Made, Sold, &c.

Quantity Made (meter register and estimated).	Quantity Sold.		Quantity Accounted for.	Number of Public Lights.
	Public Lights and under Contracts (estimated).	Private Lights, per Meter.		
Thousands.	Thousands.	Thousands.	Thousands.	
1,704,437	41,539	1,537,098	1,604,203	4016

The remaining statement is the balance-sheet, which gives the value of the stores in hand at the close of the half year as follows: Coal,

oil, &c., £17,026; coke and breeze, £1886; tar, ammoniacal liquor, sulphate of ammonia, &c., £7842; sundry stores, £33,144—total, £59,898. A sum of £20,443 stands in the balance-sheet as employees' bonus and savings.

GAS SUPPLY AT NEWPORT (MON.).

A Bright Outlook—Workmen's Thrift.

The Chairman of the Newport (Mon.) Gas Company—Mr. R. Laybourne—was able to congratulate the shareholders, at the half-yearly meeting last Wednesday, on the favourable result of the working in the six months ending the 30th of June. The accounts showed a sum of £10,312 available for distribution; and in their report the Directors recommended the payment of the statutory dividends. The Chairman remarked that, owing to the advance in the price of coal, they had not been able to realize their hopes and expectations; but they had found it possible to give some relief to a section of their consumers by a reduction in the price of gas to be used in engines. When relief came to them in the shape of a reduction in the cost of coal, the Board would not be unmindful of the claims of other consumers. As to the future, when the Board could see their way to afford relief to their consumers without injury to the interests of the stockholders, they would not neglect to grant such relief. Owing to the extra cost of coal, some gas companies had found it necessary to advance their prices. But the Newport Company, having an option in their contracts to increase the quantity, exercised it; and this afforded relief during the last, and it was still operating in the current, half year. The prospects of gas companies were on the whole as bright as the light they supplied. The craze of electric lighting was passing; and as a result those cities and towns which had discarded its use in favour of gas were well satisfied with the change, and the immense saving was also highly satisfactory to the ratepayers. Referring to the accounts, Mr. Laybourne said that additional capital was required to meet the outlay on new mains in districts not previously supplied, and also an extension of coin meters, of which they had now in use 8818, together with 10,469 gas-cookers and 3142 gas-fires. To meet this expenditure, the Board decided to issue new stock to the extent of £15,851, which was done by advertised tenders, and realized a profit of £1777 in premiums. They had sold 15½ million cubic feet of gas over and above that sold in the first half of last year; and, to compensate to some extent for the increased cost of coal, coke had, in sympathy with coal, realized better prices. The reserve and depreciation funds were in a healthy state, and the Thrift Society was being better appreciated by the employees, who had now, as a result of their savings, £849 standing to their credit, in addition to £800 of stock of the Company. The Board were gratified to find their workmen looking more favourably on this fund, which was established entirely in their interests. The result of their trading was that they were able to pay the statutory dividend without recourse to the reserve fund. The report was adopted, and the dividends recommended were declared. Replying to a vote of thanks to the officers, the Secretary (Mr. T. H. Hazell) remarked that they were proud to serve under so admirable a Board of Directors as those at the head of the Company; and the Engineer (Mr. T. Canning) said he had the greatest interest in the welfare of the concern. He added that the staff had done their work cheerfully, and that the business of the concern was increasing.

WATER GAS AT BELFAST.

In moving the adoption at the last meeting of the Council of the minutes of the Belfast Gas Committee, the Chairman, Mr. J. A. Doran, made some remarks with reference to objections that had been urged against carburetted water gas.

He said that in 1898 a Departmental Committee investigated the question; but since then no further action limiting the proportion to be used had been taken. To-day there were 108 companies and corporations throughout the country supplying carburetted water gas, in proportions varying from 2 to 67 per cent. of their total output—each one using the proportion found best suited to its needs. Some, indeed, had employed 50 per cent. and over for the past thirteen years, with perfect satisfaction to the consumers. Last year, the Belfast Committee's proportion varied from 22 to 45 per cent.; and it was not probable that a much larger percentage would often be required in future. But denial of liberty to make use of the system as required to meet emergencies would mean an otherwise needless expenditure on new works of half-a-million of money. It would be a great misfortune if a system so elastic, and tending so much to the welfare of the community, were to be hampered by arbitrary restrictions, and that without any just grounds for interference. Parliament evidently took this view of the matter, as no limit to its supply had been imposed. The only charge against carburetted water gas was the extra quantity of carbon monoxide it contained as compared with coal gas. It was represented as being more poisonous than coal gas, which was not true as regarded its constituents, but only as to the proportions. Coal gas contained a varying proportion of carbon monoxide up to 12 per cent., according to the coal used, and would destroy life if inhaled in quantity. Were it the case that coal gas was harmless, and carburetted water gas poisonous, the argument against the latter would be intelligible. Victims often succumbed to coal gas, and recovered from the effects of inhaling carburetted water gas; so that if gas poisoning was to cease, the supply of both must be done away with. From a hygienic point of view, no other charge had been made against water gas than that it was inimical to the public health. But, as a matter of fact, in the living-rooms of their population, it was much more healthy than coal gas, because not only was less oxygen required for its combustion, but it was practically free from sulphur compounds. Of course, it would be thoroughly understood that the gas which was being sent out was both useful and safe.

In seconding, Mr. Boyd said it had been stated that the quantity of carburetted water gas in the public supply varied between 17 and 45 per cent., notwithstanding the recommendations of the Departmental Committee. However, he would deal with the matter in committee. Mr. Barkley asked what was the relative cost of water gas and coal gas, and the relative profits from them. He would like to know, also, how often the percentage fell as low as 17, and how often it rose (and at what period of the year) to 45 per cent. He had tried to make inquiries about the matter, but had been put off with a bald statement. Mr. Doran replied that the cost of carburetted water gas was much less, it was very handy, and was a great saving to the ratepayers. The illuminating power was up to the standard of the Act—namely, 16 candles. Since Mr. Sharpe took over the management of the gas-works, there was no man who had paid more attention to his duties, or had done more in carrying out his work for the benefit of the community.

GAS AND ELECTRICITY AT MALTON.

The report for the six months ending the 30th of June which was presented by the Directors of the Malton Gas Company at the recent half-yearly meeting showed that, notwithstanding the keen competition of the Northern Counties Electric Light Company, who have secured the contract for the lighting of the public streets, and also certain motive power contracts in Norton, the Company are still holding their own. The Directors stated that the business was in a satisfactory condition; the increased sale of gas for the half year was equal to 5½ per cent., and the sales of residual products and gas-fittings have been more than usual. The profit balance for the half year was £1731. Adding to this the amount brought from the last account (£1665) and the interest allowed by bankers, a total of £3426 was available for the payment of dividends. The Directors proposed a dividend of 6 per cent.; after payment of which and other charges there would be a balance of £1861 to be carried forward. The total sale of gas for private consumption during the half year amounted to upwards of 26½ million cubic feet; and this, with the small portion of public lighting which the Company have in hand, brought in a total revenue of £3238. The Chairman (Mr. Hugh W. Pearson), in moving the adoption of the report, congratulated the shareholders on the very satisfactory results of the half-year's work, and on the sound position of the Company. There had, he said, been an increased consumption of gas equal to 5½ per cent.; and after paying their usual dividend of 6 per cent.—all earned in the period covered—they would be £200 better off than when they commenced it. He was afraid the increased consumption would not be continued. They had lost as customers the electric light people, who had used gas for their motive power, but had now put down gas plant of their own. He would, however, remind the shareholders that the Company had been supplying gas to the Electric Light Company at a very cheap rate; and the loss of their consumption would not be anything like so great as that of an ordinary consumer. They hoped to recoup this loss in great part by saving expenses. The Chairman concluded by alluding to the increase in the price of coal, which he attributed to the abolition of the tax, and said the Directors intended to wait to see if the present high figure was likely to be permanent before raising the price of gas. The report was adopted, and the dividend recommended was declared.

PUBLIC LIGHTING IN PADDINGTON.

Testimony in Favour of Gas.

At the last meeting of the Paddington Borough Council, the Works Committee submitted a report reminding the Council that a deputation attended before them on the 19th of February last with reference to the better lighting of Harrow Road, and read a memorial signed by nearly 200 ratepayers in support of their representations. The subject was referred to the Committee for consideration and report, and they had most carefully considered the whole matter. They had had a night view of the thoroughfare in question, and had some experiments carried out with improved gas and electric arc lamps. With regard to gas lighting, the Borough Surveyor (Mr. E. B. B. Newton) had submitted the following scheme for lighting a section of the road, by which every alternate light would be extinguished at 12.30 midnight: Existing lamps replaced by two-light No. 4 Kern burners, (1) initial cost £130, (2) actual cost £350; replaced by two-light inverted burners, (1) £190, (2) £330; by three-light burners, (1) £220, (2) £460; by five-light burners, (1) £280, (2) £720; by six-light burners, (1) £380, (2) £880. The Committee considered that this portion of the road could be satisfactorily lighted with 24 electric arc lamps, half turned out at 12.30 midnight, for the sum of £264 per annum (*plus* £10 initial cost for alterations to some of the existing lamp-columns), against £190 per annum for lighting with the present gas-lamps at the increased price of gas. They accordingly recommended that arrangements should be made with the Metropolitan Electric Supply Company, Limited, for the lighting with electricity of the portion of road specified at an estimated annual cost of £264 on an agreement for ten years, and at an estimated initial cost of £10 for alterations to certain existing lamp-columns.

The Finance Committee, in a report on the above matter, drew attention to the fact that the proposal opened up the question of electric lighting for the whole of the borough, which would involve the Council in additional expense. On the motion for the adoption of the report and recommendation, Mr. Blackwood moved a reference back. In the course of his remarks, he said he had tried the electric light himself and found it a failure; for he had better light with gas and had saved £10 a year. Sir George Fardell, in seconding the reference back, said he was astonished at the recommendation, which sought to bind the Council to a ten-years' agreement and to introduce electric lighting into the streets, which he contended were very well illuminated at present by gas. Mr. Muzzell said the electric light had been tried in Westbourne Terrace, and had not been a success. This had been shown by the fact that the Council had decided to remove the arc standards. Mr. Beverly said he had tried incandescent gas and electric light, and had found the former far cheaper and better. On a division, the reference back was carried by a majority of four.

WATER SUPPLY TROUBLES IN SPAIN.

The shareholders of the Seville Water-Works Company, Limited, had anything but an encouraging report to receive at their meeting last Wednesday; but the difficulties which make things as they are, are of a kind that no Board of Directors could control. Mr. Cowley Lambert, the Chairman, submitted the report of the Directors. In his speech, he said the shareholders would notice that the amount transferred from the profit and loss account was considerably less than it was last year. This was not due to any falling off in the business of the Company, because there had been a small increase of 2600 pesetas in the water-rentals. The difference in the profit for the year was to be found in the increase in the expenditure, due principally to special outlay on repairs and renewals of machinery, to the replacement of temporary and wasteful machinery by new and permanent plant of greater economy, to the repayment of the amount expended by the Municipality upon the upkeep of a bridge in previous years, for which the Company had been adjudged liable, to the larger amount of water taken from the Santa Lucia spring and aqueduct, and to the provision for arrears of taxation. The increase of expenditure under the heading of maintenance and repairs amounted to something like 12,415 pesetas. This was made up by 11,180 pesetas repairs to the bridge, which included a cash payment to the Municipality of 5000 odd pesetas in respect of maintenance since 1898. In connection with this, arrangements had been made with the Gas Company to pay 1000 pesetas per annum as wayleave for the main across the bridge; and the Directors hoped this would, in some measure, go to meet any expenditure upon the structure in the future. The amount of increase in maintenance was completed by 1200 pesetas on account of the bursting of a 21-inch main. The next point was the pumping and engine charges, which had increased by 17,756 pesetas. This was largely made up of extraordinary repairs which had been executed during the past year. The chief item, of course, of the extra expenditure was that of taxes. The Government had largely been, like the British Government, looking up the taxpayers; and the Board had considered it right and proper they should at once make provision for the payment which might be due out of the present balance-sheet. Expenditure in connection with the drought—amounting to 28,000 pesetas—included some new plant at Las Aceñas, which plant was much more economical in working. There had been an increase in the Santa Lucia water purchased of 23,000 pesetas. These were the items that brought up the expenditure of the year to such very large figures. But he might say, it was all abnormal expenditure, though as far as could be seen, the drought was becoming accentuated year by year, and nobody knew when there would be rain again. They were left with the small balance of £3153; and this, with the unappropriated balance of last year, made the amount standing to the credit of the profit and loss account £7453. It was proposed to carry the amount forward; inasmuch as during the next two years they had to pay off some £6000 of mortgage on the Clavinque property. The Directors considered their policy had been fully justified in securing a supply at Clavinque; for, if they had not done so when they did at a most critical moment, the position for the Company would have been a serious one. He was sure the shareholders would regret with the Directors the serious illness of Mr. C. A. Friend, their Manager, which had no doubt been brought about by the very great worry and anxiety that their business has caused him during the past few years, and which had led to his resignation. There was one further point of interest; and it was that the Municipality of Seville had apparently at length recognized the fact that shortness of water was not so much due to any want of *bona fides* on the part of the Company as to the act of Providence. An analysis in Mr. Friend's report of the extraordinary shortage of water during past years showed that last year the rainfall in Andalusia exhibited a deficiency of no less than 67 per cent. of the mean of 37 years. If the springs continued to fall as they were doing all round the hills near Seville, they would have to look to the River Guadalquivir for a supplementary supply. The motion was seconded by Mr. T. Percival Wilson. Subsequently there was some inquiry by shareholders into certain of the matters referred to by the Chairman; but in all cases it was seen that the inexorable conditions of the situation had not left the Directors any other course than that adopted. The acceptance of the report was agreed to; and a pension of not exceeding £200 a year was voted to Mr. Friend, "such pension to be payable only during the pleasure of the Board of the Company for the time being." The retiring Directors (Mr. Easton Devonshire and Mr. F. S. Jackson) were re-elected, as were also the Auditors. The customary acknowledgment of services concluded the proceedings.

Gas Poisoning Case at Oxford.—An Oxford carpenter, who was found in an unconscious state in his bedroom with the gas-jet partially turned on, subsequently died; and the Coroner's Jury returned a verdict that he was accidentally poisoned by coal gas. It was stated that deceased had not been in work since October; but that he was not a man likely to commit suicide. He had been in the habit of fastening his bedroom door; and the window was shut. The gas was alight when he went to bed; but the draught from a space at the top of the door might, one witness said, have blown the flame out.

Record Sale of Gas at Littleborough.—The sale of gas at Littleborough for the twelve months to June 30 amounted to 60,115,700 cubic feet—which was a record; the increased sales being due to the popularizing of gas for domestic uses, and not to an extension of the district. The production of gas per ton of coal carbonized for the year averaged 10,894 cubic feet, and the coke made for sale 10·8 cwt. At the recent half-yearly meeting, the balance-sheet was adopted, and a dividend at the rate of 10 per cent., less income-tax, was declared for the six months. There was a disposable balance of £2708. Satisfaction was expressed by the shareholders with the results; and votes of thanks were accorded to the Directors and to the Manager and Secretary (Mr. S. E. Halliwell) and other officers of the Company.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Perth Town Council sat specially on Monday to consider the accounts and estimates in connection with the various city departments. Mr. Hamilton, the Convener of the Gas Committee, submitted the gas accounts. The proposed increase of 3d. in the price of gas, he said, was to be attributed to the fall in the receipts from bye-products and the rise in the price of coal; but he was hopeful that the estimated income and expenditure would come out nearly correct. If the price of secondary products kept up, he was hopeful that there would be a satisfactory balance. An increase of 3d. per 1000 cubic feet of gas would produce £2250, or £750 for each penny. Lord Provost Cuthbert pointed out that only 35 per cent. of the gas revenue was collected at the office, and he thought a new departure should be made in regard to this. Only one out of every three consumers got discount. He was of opinion that, instead of the present discount, they should give a 5 per cent. rebate to consumers who paid at the office within twenty days. The system had been found to work well in Aberdeen and other places. He thought that would be a most popular departure, and should be considered by the Convener next year before he made up his estimates. The accounts and estimates were adopted, and the price of gas raised as proposed.

The Gas Committee of the Dumfries Town Council recommended the other day, by a majority, that the price of gas be raised by 2d. per 1000 cubic feet—from 2s. 10d. to 3s.—except when consumed through prepayment meters, which is to be retained at 3s. 6d. A firm in the town, who are large consumers of gas, wrote to the Council asking for special terms, on account of the size of their account. Their greatest rivals, the writers said, were in Aberdeen, where gas for lighting cost 2s, 7d., and for power 2s. 4d. per 1000 cubic feet; and in Glasgow, where the respective costs were 2s. 4d. and 2s. In Aberdeen a discount of 10 per cent. was allowed upon accounts of 500,000 cubic feet, making the net price 2s. 1d. In Dumfries, the discount upon a 2s. 7d. rate was only 4½ per cent. There was a long discussion in the Council; but not upon this somewhat threatening letter. The question which divided the Council was whether the price of gas should be advanced by 2d. or 1d.; the consideration which moved those who supported the 1d. increase being more the interest of the working classes than that of large consumers. In closing the discussion, Bailie Thomson, the Sub-Convener of the Gas Committee, said that they took into consideration the interests of all classes. All they wished to do was to see that the price was fixed at a figure at which the gas could be profitably supplied without any loss to the community. They were not paying off their debt as rapidly as they ought to do. His opinion was that at the end of the period the reserve fund should be used for this purpose. It was necessary that the debt should be paid off as quickly as possible, especially in view of the fact that it was now thirty years since they took over the gas-works. While they might scrape along with a rise of 1d., he warned them that the price of coal had possibly not yet reached its full height. The increase of 2d. was agreed to by fifteen votes to six; and the letter from the firm of power users was sent to the Committee for consideration and report.

The Gas Committee of the Kirkcudbright Town Council reported the other day that they had accepted coal tenders as follows: 50 to 70 tons of Muirkirk cannel, at 23s. 9d. per ton; 400 tons of splits at 16s.; and 400 tons of Sanquhar doubles at 14s. 3d. A letter from the Glasgow and South-Western Railway Company was read, intimating that the Directors had under consideration the lighting of their station premises in the town, and that, in view of the high price of gas, they had in contemplation the laying down of plant for the production of acetylene gas. Before, however, deciding definitely they wished to be informed if the Council could grant any reduction in the price charged, which is 6s. 3d. per 1000 cubic feet. Mr. Brown said that the Council could not do anything under present circumstances. The price of coal was so high that in other places they had been increasing the price of gas, whereas in Kirkcudbright they had been reducing it.

In the Grangemouth Town Council last week, Bailie Wood, in moving approval of the Town Chamberlain's report upon the burgh finances, said that, as regarded the gas undertaking, it was very satisfactory to know that they were in the strong position the accounts showed them to be in. He thought they had taken the right step in paying off the £764 which the transfer of the works had cost; and while they did not need to begin their sinking fund for repayment of their loans for another year, they would be in the position this year of having something to meet the increased price of coal.

In one of our Scotch daily newspapers I have this week seen an article dealing with agricultural affairs, which appears to be founded upon a report in the "Journal of the Board of Agriculture" regarding experiments at Kew, the object of which was to free the farmer of the troublesome pest known as the eelworm. The remedy recommended is sulphate of potash, along with deep ploughing, and for the sterilizing of infected land a dressing of gas lime. The lime it is recommended should be allowed to lie on the surface of the ground for some time, and then be ploughed in with a light furrow.

At the half-yearly meeting of the Coatbridge Gas Company on Thursday, it was reported that the Consumption of gas, including 2½ million cubic feet for motive power at a special rate, had amounted to 80,931,000 cubic feet—an increase of more than 9 millions over the corresponding half year. It was agreed to pay dividends at the rate of 11½ per cent. upon the original ordinary stock, and 8½ per cent. upon the later issues.

The annual meeting of the East Wemyss and Buckhaven Gas Company was held on Wednesday. The report of the Directors stated that there had been a large increase in the consumption of gas, and that the profit on the year's business was £519. A dividend at the rate of 4 per cent. was declared.

Two somewhat serious explosions of gas occurred in Glasgow—one in a tenement in Garngad Road on the evening of Friday of last week, and the other in a house in Argyle Street on Monday morning. The more serious of the two was the one in Garngad Road. A labourer named

Slaven, when he returned from work, noticed a smell of gas as he passed up the stair. A one-roomed house on the first flat was unoccupied, and Slaven went into it to search for the leak in the gas-fittings. He turned off the gas, as he believed, at the meter, and then struck a match. The explosion which followed produced so much damage to the property that the authorities ordered the tenants out and barricaded the street. Seven persons were injured, and were treated at the Royal Infirmary. Next day the circumstances of the explosion were inquired into by the Master of Works and several of the officials from the Gas Office. It was then found that the gas-meter—a prepayment one—had been wrenched from its position, with the object, it is understood, of getting at the cash-box. The police are investigating the matter. The explosion in Argyle Street was caused by Mr. S. Evans, the occupier of the house, striking a match in searching for a leak of gas. He was thrown out of the drawing-room, and was so severely burned that he was taken to the Western Infirmary for treatment. A partition wall in the house was damaged.

At the seventy-sixth annual meeting of the Banff Gaslight Company, the report of the Directors which was submitted was a very satisfactory one. A dividend at the rate of 4½ per cent. was paid, and £31 was carried forward.

Mr. R. T. Leitch, in submitting the annual accounts to the Newport Town Council on Monday, brought out that the expenditure generally had exceeded the income by £175, but remarked upon the healthy condition of the Gas Department, in which there was a credit balance of £926. This figure was realized after setting aside £250 to a special reserve fund, paying off the annual instalment of capital and interest, and making a contribution to the meter and stove reserve fund. During the past six years the consumption of gas had gone up fully 75 per cent. The state of affairs, Mr. Leitch said, reflected great credit upon the Convener (Mr. John O. Robertson) and upon the Manager (Mr. John F. Black), whose services the Council and ratepayers alike heartily appreciated.

Cardiff Water-Works Inspection.—In connection with the annual inspection of the Taff Fawr Water-Works by the Cardiff Corporation last Wednesday, a visit was made to the site of the new storage works to be constructed at Llywnon. The capacity will be over 900 million gallons; and what is now a valley will be transformed into an area of water a mile long and a quarter-of-a-mile broad, with a depth of 70 feet, On the completion of the scheme (at an estimated cost of £230,000), it is anticipated that Cardiff's needs will be supplied for thirty or forty years to come. The party subsequently drove to the Cantreff reservoir; and at the luncheon which followed, the Lord Mayor (Sir William S. Crossman) proposed "Success to the Water-Works Undertaking." He coupled with the toast the names of Alderman David Jones, the Chairman of the Water-Works Committee, and Mr. C. H. Priestley, the Water Engineer. He had, he said, heard from the visitors many expressions of approval of the fine supply of water they had.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia. LIVERPOOL, *Aug.* 10.

The market has been quiet during the week, there having been no special demand from any particular quarter. On the other hand, however, the shipments during July have been heavy, exceeding those for the same month of last year by about 4300 tons, and this would tend to show that there is no accumulation of stocks at any point. Prices remain at £11 15s. per ton f.o.b. Hull, £11 16s. 3d. to £11 17s. 6d. per ton f.o.b. Liverpool, and £12 per ton f.o.b. Leith. As regards forward delivery, the position is practically the same as it was at the end of last week. Business has been done over the near months at about prompt prices; but for delivery over the spring months, the prices held by makers have prevented business.

Nitrate of Soda.

This article is quiet but steady at 11s. 1½d. to 11s. 4½d. per cwt., according to quality.

Tar Products. LONDON, *Aug.* 10.

The markets for tar products are still quiet all round, and there are not any signs of a great revival of business at present. Pitch is quiet; and consumers generally are disinclined to buy forward just now, unless they can purchase upon terms very little in advance of current prompt prices, to which, of course, dealers will not agree at present. Creosote is firm, but without very much doing. Prices are, however, well maintained, and, with every prospect of good business in the coming few months, will doubtless remain firm. Makers are well sold, and determined to hold their hands at present, unless they can get an advance upon to-day's values. Benzol, 90 per cent., is still depressed and difficult of sale. The same remark applies to nearly all refined products, all of which have been offering for both prompt and forward delivery at low figures without much success. Carbolic acid appears to be rather firmer. Continental consumers have in some cases slightly raised their limits; but even now they are very much below the ideas of manufacturers. Crystals are dull, and altogether without interest. Creosote salts and naphthalene are both steady and in good demand. Anthracene is without change; and the quantities which are now made are very small. Tar is still sellnig well, but at moderate prices.

The average values during the week were: Tar, 15s. 6d. to 20s. Pitch, London, 26s. nominal; east coast, 25s. to 25s. 6d.; west coast, 23s. 9d. to 24s. 6d. Benzol, 90 per cent., 7⅞d. to 8⅛d.; 50-90 per cent., 8¼d. to 9¼d. Toluol, 10¼d. to 11⅛d. Crude naphtha, 4d. to 4¼d.; solvent naphtha, 1s. to 1s. 2¼d.; heavy naphtha, 1s. 1⅛d. to 1s. 3¼d. Creosote, London, 2⅞d. to 3d.; North, 2¼d. to 2⅞d. Heavy oils, 3d.

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Sulphate of Ammonia.

This article is unaltered, and very little business is doing. The principal London Gas Companies still ask £12 2s. 6d. to £12 5s. for forward delivery, and £12 1s. 3d. for prompt. Ordinary London makes can be bought at £11 13s. 9d. to £11 15s. In Leith, the ruling price is about £12 to £12 2s. 6d., Liverpool £11 16s. 3d. to £11 17s. 6d., and Hull £11 15s.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The holiday season may now be said to be at its height. Last week was a very broken one, and but little business was done on the Coal Exchange. Coal continues to command full rates. The large exports which are continually going out from both east and west coasts strengthens the hands of colliery owners, who are practically independent. A few days ago the writer found 17 boats at Hull waiting for coal cargoes, and there were also a number of like vessels at Grimsby awaiting their turns. The English Railway Companies in some instances have had to renew their contracts at an increase of 2s. and 3s. per ton. House coal, instead of being easier, is fetching still higher rates, and the prospects are not favourable to buyers. Gas coal and cannel are dearer on contract, though there is a lull in the present demand.

Northern Coal Trade.

There is a very strong demand for export, both of steam and gas coals; and it is probable that the quantities shipped foreign from the north-eastern ports have never been so high as they now are. Best Northumbrian steam coals are from 16s. per ton f.o.b., second-class steams are from 15s. to 15s. 6d., and steam smalls are 10s. to 10s. 6d. Work at the collieries is now again very full; and the large output is readily taken up—the inquiry being very strong from Germany and the Baltic. In the gas coal trade, the shipments coastwise are low—both through the season and owing to the diversion of some of that trade to Yorkshire—but the exports are heavy. Durham gas coals vary in price from 13s. 6d. to as high as 15s. per ton f.o.b., with, perhaps, 3d. per ton higher for one or two special qualities. As to contracts, more allotments have been made for some of the French towns—Rouen and Paris for instance. For delivery over one year, about 14s. 6d. per ton f.o.b. is believed to have been paid; and for delivery over two years, 12s. 4½d. is suggested as the figure agreed upon. One or two other contracts that have been postponed are also believed to be near settlement, but for small quantities only. Coke is very firm; and gas coke has advanced in price. The production is still limited; and from 18s. 6d. to as high as 20s. per ton f.o.b. is now quoted for good gas coke.

Scotch Coal Trade.

The market is strong and active; the foreign demand being particularly large. There is no appearance of a break in prices yet, but a gentleman who is well informed gives the opinion that prices will be greatly down before the year is out. The prices quoted are: Ell 13s. to 14s. 6d. per ton f.o.b. Glasgow, splint 14s. to 14s. 3d., steam 12s. 9d. to 13s. The shipments for the week amounted to 311,535 tons—an increase of 87,313 tons upon the previous week, and of 37,510 tons upon the corresponding week of last year. For the year to date, the total shipments have been 8,384,707 tons—an increase of 469,408 tons upon the corresponding period of 1906.

Colne Valley Water Company.—At the half-yearly meeting of this Company on the 2nd inst., the Directors reported a profit of £12,610 on the revenue account for the six months ending June 30, and a sum of £12,594 available for distribution. From this balance, £1000 was transferred to the contingency fund account; and dividends were declared at the maximum rates of 10 and 7 per cent. respectively on the two classes of shares—leaving £1292 to be carried forward. For the corresponding period of 1906, the dividends were at the rates of 9 and 7 per cent. respectively; and the amount carried forward was £1661.

Maryport Water Supply.—At a special meeting of the Maryport Urban District Council last Tuesday, a recommendation of the Gas and Water Committee to duplicate the mains between Papcastle and Hayborough at an estimated expenditure of £20,000, was adopted. An additional supply of water is needed to meet the requirements of the Flimby and Broughton Moor Coal and Fire-Brick Company, who are preparing new works at Risehow for which from 10,000 to 12,000 gallons per day will be wanted. More filter-beds are to be constructed; and an engineer is to be engaged to prepare plans, &c., of the entire work, in conjunction with the Council's Engineer. The matter was referrred to the Parliamentary Committee.

Water-Works Extensions at Hull.—The annual inspection last week of the Hull Water-Works by the members of the Water and Gas Committee, was made the occasion of a small ceremony; the Mayor (Alderman H. Feldman, J.P.) being invited by the Chairman (Alderman W. G. Wharram) to turn on the water from a recent adit extension at Cottingham. This work was commenced in 1905, and has just been completed; the cost being about £10,000. Five shafts (each about 80 feet deep), and three bores (each about 200 feet below the shafts) have been sunk. From here the greatest quantity of water pumped in one day is 9,633,000 gallons, though at the present time only 5,000,000 gallons per diem is drawn from the station—this being sufficient to meet requirements. The balance of the city's total daily consumption of 10 million gallons is obtained from other stations. Subsequently the machinery, &c., was inspected; and appreciation was expressed of the work of the Engineer, Mr. F. J. Bancroft.

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Leatherhead Water Company.—The profit of this Company for the six months ending June 30 was £2246; and the amount available for distribution was £3641. At the recent half-yearly meeting, the Directors recommended a dividend at the rate of 10 per cent. per annum on the original shares, and at the rate of 7 per cent. per annum on the remainder of the shares. This would absorb £1919. They also recommended that a dividend at the former rate be declared for the half year ending June, 1885, on the share capital paid up at that date. The amount required for this was £875—making the total sum to be divided £2794, and leaving a balance of £846 to be carried forward. The Company's Engineer (Mr. F. Southwell Cripps) reported that the water supply had been satisfactory in both quantity and quality, and the plant generally maintained in good order.

The Standard Oil Company Heavily Fined.—The first stage of perhaps the most important case ever brought by the Federal authorities against a corporation closed on the 3rd inst., when Judge Landis, of the United States District Court at Chicago, inflicted upon the Standard Oil Company the heavy fine of $29,240,000 (£5,848,000). This sum was reached by the imposition of the maximum penalty for each of 1462 violations of the Elkins Anti-Rebate Law, of which the Company were convicted in their dealings with the Chicago and Alton Railway between September, 1903, and March, 1905. The Company will now appeal to the United States Circuit Court; and if found guilty, they will be liable to a fine of $38,440,000 under seven indictments now pending. It is stated that there are no less than 4422 counts under these indictments. Advices since received are to the effect that Judge Groscup, of the United States Court of Appeals, has granted an application for a writ of error in the case.

Effect of the Removal of the Coal-Tax.—At the half-yearly meeting of the Great Northern Railway Company last Wednesday, the Chairman (Lord Allerton), in moving the adoption of the report, said the increased cost of coal in the past six months was comparatively small compared with that which must appear in the accounts for the current half year. He did not want to alarm the shareholders, but they might take as the basis of their calculations that 1s. a ton increase in the cost of coal represented on the Company's consumption during the past six months £40,000 a year; and they were asked at the present to pay 3s. a ton advance. They would, therefore, see that the cost of coal was an extremely serious item. In the past six months they had had the advantage of contracts which were made at lower prices; and some of these contracts were still running. But this would not be the case beyond the end of the year; and then the Company would feel the full force of the enormous rise which had taken place in the price of coal.

New Joint-Stock Companies.—The Teneriffe Water Company, Limited, has been registered with a capital of £60,000, in £1 shares, to search for and obtain water from the extinct crater or natural basin known as Las Canadas, also water from under or near the peak called the Teide, situate in the Island of Teneriffe; to acquire any concessions, grants, decrees, rights, powers, and privileges from the Spanish Government, with a view to procuring water in the island or elsewhere in the Canary Islands; and to supply the towns or districts of and near Languna, or Santa Cruz, and the Orotava Valley. The Cook Gas-Engineering Company, Limited, with a capital of £5000, in £1 shares, is to acquire certain British patents relating to improved apparatus for increasing, regulating, and equalizing the pressure of gas, regulating gas-heated ironing machines, hand-irons, and laundry and cleaners' and dyers' apparatus; to take over the business of a gas engineer carried on by E. S. Cook at 17, Hanway Street, London, W.; and to manufacture and deal in atmospheric and other gas burners, fittings, mantles, and appliances, &c.

Large Water Scheme for Los Angeles.—An interesting project is forced on the people of Los Angeles, California, by the necessity of increasing their water supply. The place selected, says the "Los Angeles Times" (quoted in "The Times" Engineering Supplement), is the Owen River Valley, more than 200 miles north of the city and high up in the mountains. This valley is about 4000 feet above the sea level, and has a watershed of 2500 square miles. Through the valley from north to south runs Owen River, carrying an average daily flow of about 400 million gallons. The proposition is for the city to acquire by purchase the water rights of the valley, to dam the river 27 miles farther north, and by thus diverting it to carry the conduits to Los Angeles, 226 miles away. It will be the longest conduit in the world supplying a city with water. Though on its way from Owen River to Los Angeles the water must penetrate a great mountain range, it could be carried down by gravity alone without pumping or tunnelling; but it is thought better to construct 28 miles of tunnels. Five miles of this work will be in solid rock, under the mountains, in tunnels, 14 feet wide and 11 feet high, and will require five years to complete. The water needed for immediate use will be sent direct to the intake for Los Angeles, and the surplus will be sold for irrigation.

Cutting Off Water at Aldershot.—At the meeting of the Aldershot District Council a few weeks ago (see *ante*, p. 114) complaint was made by the Chairman (Mr. C. A. L. Calvert) that a consumer's water supply had been cut off for non-payment of his account; and he characterized this as a most arbitrary action on the part of the Gas and Water Company. After some discussion, the Clerk was instructed to write to the Company and suggest that, in the interests of the public health, notice should, in cases of the kind in question, be given to the Council. The Company wrote in reply that the matter had had the careful consideration of the Board, who wished to inform the Council that where it was necessary to discontinue the supply of water because of the non-payment of the rate, at least 24 hours' written notice was given to the consumer; and, if carried into effect, it had been the custom of the Company to notify the Council's Medical Officer of Health the same day. This coincided with the suggestion of the Council; and the Company hoped it would clear up any misapprehension in regard to the matter. After the letter had been read, the Chairman said a suggestion had been publicly made that the Council were inclined to dictate to other people certain courses which they did not pursue themselves. They had never prosecuted anybody for not paying his electric light account; and there was no comparison between electric light and water. The electric light was a luxury, and not a necessary of life, as was water.

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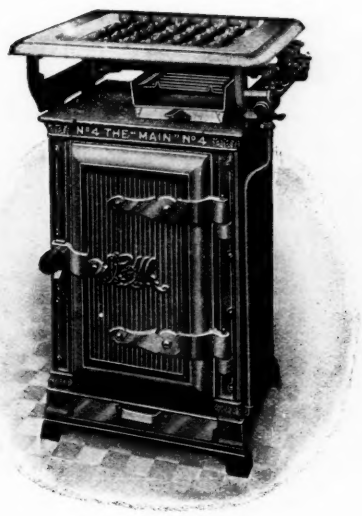

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Municipal Gas Supply in Sicily.

The United States Consul at Palermo (Mr. W. H. Bishop), in his annual report which has just reached London, gives an interesting account of the developments in relation to the acquisition of the gas undertaking by the Municipality. He says the purchase of the existing gas plant was voted in a referendum in April, 1906, there being 7988 votes in favour and 112 against in a total electorate of 18,821. The management was assumed by the City on Nov. 1, 1906. The sum paid was 4,750,000 lire (£190,000). The working staff in the service of the private Company was retained, and one of the first measures taken was to reduce the hours of labour to an important part of this force from twelve to eight per day; thus incurring in this respect a higher scale of expenditure. No lowering in the price of gas is expected at present. Much protest has already been made by the consumers on this account, and also on account of the alleged poorer quality of the gas, together with a lack of sufficient pressure to deliver it properly to the more distant parts of the town. The endeavour to furnish the pressure required increases, it is asserted, the bills of those living near the works. The Mayor issued an explanation stating that a large addition to the distributing system is needed; and he asked the public to have patience till the various difficulties of the new enterprise could be overcome. The Committee of Management, offended at the severe criticisms to which they were subjected, resigned. Following upon this the Municipal Council resigned in a body, and the Mayor with them; but it is hoped that these resignations will be withdrawn. The price of gas remains at 24 centimes per cubic metre, equivalent to about 5s. 5d. per 1000 cubic feet. This includes a tax of 4 centimes per cubic metre imposed by the National and City Governments—half by each. Gas for cooking and industrial purposes costs a trifle less; but as it is necessary to rent a separate meter for it, the difference, where the consumption is moderate, is scarcely worth mentioning. The annual rental for meters ranges from about 4s. 2d. upwards, according to the number of lights.

Price of Gas to be Increased at Durham.—At the half-yearly meeting of the City of Durham Gas Company, the Chairman (Mr. John Coward) said that, owing to the increase in the price of coal and oil, notice had been given that from the end of September the price of gas would be raised 2d. per 1000 cubic feet. The Directors had very reluctantly come to this decision; but coal was costing the Company 30 per cent. more than it did the previous year, which would make a difference to them of something like £1200 per annum. The profits for the six months to June amounted to £3198; and the sum available for dividend was £2920.

Increased Gas Consumption at Grantham.—In the report which was adopted at the half-yearly meeting last week of the shareholders in the Grantham Gas Company, the Directors remarked with satisfaction on the continued prosperity of the undertaking. There had, they said, been a very considerable increase in the consumption of gas during the past six months; and this, coupled with economical management, had placed the Company in an exceptionally strong financial position. Notwithstanding the large advance in the price of coal, the Directors did not contemplate increasing the price of gas; and in giving this benefit to the consumers, the Company would still, without difficulty, be able to pay the maximum dividend to the shareholders on the increased capital, without entrenching on the reserve fund.

"Kohlit" has been registered by Coalite, Limited, as the trade mark for their coal, coke, breeze, and partially coked coal.

The Directors of the National Gas-Engine Company have declared an interim dividend at the rate of 20 per cent. per annum for the six months ending the 30th of June.

It has been resolved in Belfast that boiling-rings, with metallic tubes and adapters, be supplied free to all gas consumers in future on application being made for them.

As the result of some lengthy trials in actual use, the Preston Corporation have placed an order for 250 Bellamy lamps with the Voelker Lighting Corporation, Limited, who own the patent for this lamp, and who have recently supplied more than 150 of them for Jamaica. There are about 15,750 fitted up in Liverpool; and the Borough Council of Finsbury are continually extending the use of them in their district.

The first annual sports of the employees at the Grangetown Gas-Works, Cardiff, were held on the 3rd inst., when about 1600 persons were present, including Colonel H. O. Fisher, one of the Directors, Mr. G. Clarry, the Secretary of the Company, Mr. Octavius Thomas (Pentre), and Mr. E. H. Swain (Pontypridd). A large programme was carried out successfully; the music being supplied by the works band. At the close of the meeting, Mrs. H. D. Madden presented the prizes to the successful competitors.

In a neatly printed official guide to Burton-on-Trent which is being circulated by the Town Council a short account is given of the gas undertaking, of which Mr. R. S. Ramsden is the Assistant-Manager, and attention is called to the specially low prices charged for gas used for heating purposes and gas-engines. These range from 2s. down to 1s. 6d. per 1000 cubic feet, according to the quantity supplied per quarter in one establishment; the last-named price being for supplies of 250,000 cubic feet and upwards.

According to the report of the Leeds Fire-Clay Company, the Directors have to deplore, for the fourth year in succession, the serious and unexampled depression in the building trade. The outlook a year ago was not then considered promising. But the demand for building material has since been even less throughout the whole country, and, as a consequence, there has been a further fall in the average selling prices, and the costs of production have been abnormally increased by the advances in the price of fuel, miners' wages, and stores. Sales were more than maintained during the year, but at prices which leave no margin of profit for dividends; the net results of the year's operations providing only for the payment of interest on debentures, £11,845, and the premium for the redemption of debentures, £2648 (the latter now amounting to £12,194).

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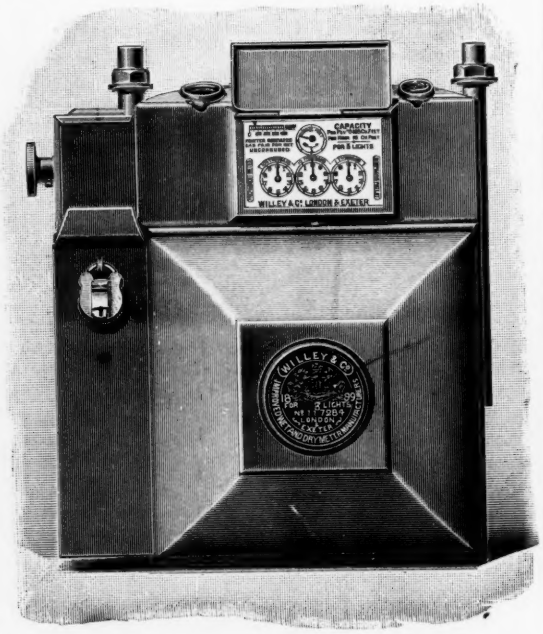

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